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TECHNOLOGY FOR DEVELOPMENT

United Nations system support for science and technology in Africa

Note by the Secretary-General

The Secretary-General has the honour to transmit to the General Assembly and the Economic and Social Council the report of the Joint Inspection Unit entitled "United Nations system support for science and technology in Africa" (JIU/REP/94/1).

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ANNEX

UNITED NATIONS SYSTEM SUPPORT FOR SCIENCE AND TECHNOLOGY IN AFRICA

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Joint Inspection Unit

Geneva
1994

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Acronyms

ACC	Administrative Committee on Co-ordination
ECA	Economic Commission for Africa
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization of the United Nations
ICAO	International Civil Aviation Organization
IITA	International Institute of Tropical Agriculture
ILO	International Labour Organisation
IMF	International Monetary Fund
IMO	International Maritime Organization
IRA	Institute for Agronomic Research
ITU	International Telecommunication Union
JIU	Joint Inspection Unit
OAPI	African Intellectual Property Organization
OAU	Organization of African Unity
OPS	Office for Project Services
SENARAV	National Programmme of Applied Agricultural Research and Propagation
UN-NADAF	United Nations New Agenda for the Development of Africa in the 1990s
UNCSTD	United Nations Centre for Science and Technology for Development
UNCTAD	United Nations Conference on Trade and Development
UNCTC	United Nations Centre on Transnational Corporations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFSTD	United Nations Fund for Science and Technology for Development
UNIGSTD	United Nations Intergovernmental Committee on Science and Technology for Development
UNIDO	United Nations Industrial Development Organization
UPU	Universal Postal Union
VPA	Vienna Programme of Action for Science and Technology for Development
WHO	World Health Organization
WIPO	World Intellectual Property Organization
WMO	World Meteorological Organization

LIST OF EVALUATED PROJECTS

Title	Reference	Executing Agency	Report Acronyms
A. GLOBAL			
1. Root and Tuber Crops Technology	GLO/87/001	UNDP/OPS	RTCT
B. REGIONAL			
2. African Regional Centre for Technology	RAF/87/068	ECA	ARCT
3. African Regional Centre for Engineering Design and Manufacturing	RAF/87/067	ECA	ARCEDEM
4. Ecole multinationale supérieure des Postes de Brazzaville	RAF/81/053	UPU	EMSP/ Brazzaville
5. Ecole multinationale supérieure des Postes d'Abidjan	RAF/72/1B	UPU	EMSP/ Abidjan
6. African Network of Scientific and Technological Institutions	RAF/83/021	UNESCO	ANSTI
7. Establishment and Strengthening of Industrial Property Systems	RAF/87/015	WIPO	ESIPS
8. Centre de formation et d'agrométéorologie appliquée	RAF/74/080	WMO/FAO	AGRHYMET
9. Centre multinational de formation en aviation civile de Mvengue	RAF/87/027	ICAO	CMFAC
10. Ecole supérieure multinationale des télécommunications	RAF/87/011	ITU	ESMT
11. Regional Maritime Training Academy	RAF/84/023	IMO	RMTA
C. NATIONAL			
12. Egyptian Cabinet Information Decision Support Centre	EGY/85/006	UNDP/OPS	IDSC
13. Ethiopian Centre for Technology	ETH/74/001	UNCTAD	ECT
14. Réorganisation du Département de la fonction publique du Zaire	ZAI/84/012	DTCD	DFPZ
15. Rehabilitation of Ghana State Gold Mining Corporation	GHA/84/001	DTCD	SGMC
16. Centre national de qualification professionnelle	SEN/82/005	ILO	CNQP

EXECUTIVE SUMMARY

1. Since the adoption in 1979 of the United Nations Vienna Programme of Action for Science and Technology for Development, this subject has consistently featured on the agendas of all subsequent major United Nations system conferences, thus indicating the ever-growing importance that Member States assign to science and technology issues. The response of organizations of the United Nations system in supporting implementation of the Vienna Programme of Action has not matched the expectations and needs of many developing countries. The significant international financial support anticipated by the programme of action has not materialized. The science and technology policies and programmes of the United Nations system are hardly co-ordinated around strategic goals, institutional and programme adjustments appear inadequate and there is no common operational science and technology framework.

2. These shortcomings are mirrored through the findings of the present report in its evaluation of the United Nations system support for science and technology capacity building in Africa. The eight operational guidelines adopted in 1983 by the United Nations Intergovernmental Committee on Science and Technology for Development (UNIGSTD) for use by the System as a whole are hardly applied at the field level by all the organizations. Ten science and technology institution-building functions used by the Inspectors for the present evaluation were effectively combined in less than half of the 16 projects included in the sample. Little or no attention was given by most projects to the crucial issues of sustainability and linkages to the production system.

3. The report also finds that some fundamental prerequisites (political, economic and educational) would need to be fulfilled in order to stimulate and expand science and technology development in the African region. The supportive role of the United Nations system should concentrate increasingly on a few strategic areas, such as policy reform initiatives co-ordinated with World Bank and IMF-supported macroeconomic adjustment programmes, building of science and technology awareness, policy and institutional capacities, efficiency reforms in national public services through the introduction of appropriate technologies and systems of accountability and control, support for Science and Technology programmes that attract local and external investments, etc. The Inspectors offer the following main recommendations.

RECOMMENDATIONS

Recommendation 1 - Institution-building functions

Organizations of the United Nations system should refine and adopt at the level of ACC, mutatis mutandis, the ten institution-building functions used in the present report as a normative framework for the design, execution and evaluation of institution-building projects in the low income countries generally and in the least developed countries (LDCs) more particularly. The framework should be incorporated into the organizations' technical co-operation policies and procedures manuals.

Recommendation 2 - Sustainability

All institution-building project proposals should be justified by a thorough pre-feasibility analysis of the long-term cost benefits and financial sustainability of the supported institution, as the main condition for United Nations system support, and self-financing project activities should be encouraged and reflected in project designs whenever appropriate. The relative cost-effectiveness of different implementation strategies and tools should also be examined.

Recommendation 3 - Programme approach

The programme approach to technical co-operation mandated by the General Assembly in resolution 44/211 should be applied more systematically and comprehensively to institution-building projects.

Recommendation 4 - Technical backstopping

(a) All funding organizations of the United Nations system should consider the possibility of a set of penalties, to be agreed upon at the level of ACC, so that the designation of executing agency is made subject to past performance, which also takes into account the performance of national counterpart institutions.

(b) Project agreements should explicitly specify and quantify the direct technical inputs to be provided by the regular personnel of the executing agency within or outside the United Nations system (e.g., total man/months to be devoted to the project, number of technical missions to be conducted, volume of science and technology literature to be produced or provided to the project, etc).

Recommendation 5 - Chief Technical Advisers

Justification for the Chief Technical Advisers position should be very clearly established for projects supporting well-established institutions at the national or regional level, which should be used increasingly as implementing agencies.

Recommendation 6 - Linkages to the production system

The end-users targeted by institution-building projects should, to the extent feasible, be involved in the design and planning stages of such projects, and linkages to the production system and to the private sector more particularly should be specified clearly in project agreements, depending on the nature and objectives of the project and local conditions.

Recommendation 7 - Regional Setting

Within the framework of the United Nations New Agenda for the Development of Africa in the Nineties, the Secretary-General of the United Nations should:

(a) initiate discussions at the highest level of ACC concerning the possibility of increased United Nations system policy and programmatic collaboration in support of science and technology capacity building in Africa, especially in the key areas identified in chapter III of the present report;

(b) consider the feasibility and timeliness of establishing a few pilot science and technology strategic institutions of national or subregional scope as recommended in paragraphs 72-73;

(c) undertake consultations in the context of UN-NADAF on the possibility of a Summit Meeting by the Organization of African Unity on science and technology for development in Africa, with substantive contributions from all organizations of the United Nations system.

Introduction

1. For over thirty years the United Nations General Assembly and Economic and Social Council have focused global attention on the central role of science and technology in the development process. Among the early initiatives on this subject was the 1963 "United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas", which examined ways and means of accelerating development through the application of scientific and technological innovations.

2. Other subsequent initiatives progressively led to the 1979 Vienna Conference on Science and Technology for Development, which adopted the Vienna Programme of Action (VPA) on the subject. The VPA, whose validity was reaffirmed by the General Assembly in 1989, still represents the most comprehensive and authoritative framework for national and international efforts in this area.

3. The VPA did set forth three fundamental goals for the international community:

(a) strengthening the endogenous capacity of developing countries in science and technology development;

(b) restructuring international scientific and techno-logical relations; and

(c) strengthening the role of the United Nations system, including provision of additional resources, in its support for developing countries' efforts in building endogenous capacity in science and technology.

4. The considerable amount of documentation that has been produced to date on the subject within and outside the United Nations system since the adoption of the VPA in 1979 is certainly indicative of the ever-growing international awareness about the role of science and technology as an instrument of development. The documentation also suggests that the volume of activities and probably resources devoted to this subject area by the United Nations system has also increased over the past decade.

5. Since 1979, moreover, science and technology issues have consistently been on the agendas of major United Nations system conferences, such as the eighteenth special session of the General Assembly, Ad Hoc Committee for the preparation of the International Development Strategy for the Fourth United Nations Development Decade, the Second Conference on Least Developed Countries, UNCTAD VIII or the United Nations Conference on Environment and Development. The scope and pace of these intergovernmental initiatives in the field of science and technology leave no doubt about the capital importance that this subject has assumed for the Member States, and the additional efforts required from the organizations of the United Nations system in support of endogenous science and technology capacity building in the developing countries.

6. Some studies[1] reviewing the extent of United Nations system support for the VPA to date have pointed to various inadequacies, the most notable being: lack of harmonization and co-ordination of the system's policies and programmes in science and technology owing to the apparent ineffectiveness of central intergovernmental bodies, especially the Intergovernmental Committee on Science and Technology for Development (IGCSTD), to inspire a sense of common purpose and action into the multiplicity of policy and Secretariat bodies concerned with the subject within the System; the drastic shortfall in financial resources originally anticipated by the VPA, resulting in the termination by the General Assembly in 1986 of the United Nations Financing System and the transfer of its resources to the United Nations Development Programme (UNDP); inadequate institutional adjustments within many organizations in line with the recommendations of the VPA; or the absence of a common operational definition of the subject area, etc.

7. Clearly, these and related problems that frequently appear in the abundant United Nations system literature on the subject essentially revolve around the upstream aspects of policy, organizational and institutional arrangements, so much so that very little is documented on the downstream operational results of science and technology activities. Further, the organizations' reporting systems tend to place undue emphasis on the supply/input aspects of their science and technology programmes and projects. As such only scant information is being reported to the policy organs about actual outputs, their dissemination and socio-economic spillover effects in the productive sectors.

8. This limited feedback of information to the policy organs from the field level is a serious gap that needs to be filled in order to ensure that intergovernmental policy formulation and directives in matters of science and technology are founded on credible and objective information rooted in field experiences and realities.

9. The present report, the first of three planned by the Joint Inspection Unit (JIU) on this subject, attempts to address that gap by taking a hard look at what is actually happening on the ground. In view of the complex and extensive nature of the subject, focus has been narrowed on science and technology institution-building. The report evaluates the operational performance and outputs of 16 institution-building projects supported in Africa by United Nations system organizations in the area of science and technology for development. The 16 projects form part of a broader sample constructed by the Inspectors to cover the three developing regions of Africa, Asia and the Pacific, Latin America and the Caribbean. Subsequent reports will cover the latter two regions.

10. Some conceptual variations that came to light from one organization to another about what really constitutes science and technology for development

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[1] See, for example, cross-organizational review of the medium-term plans of the organizations of the United Nations system in the area of science and technology for development (E/1987/511); End-of-Decade review of the implementation of the Vienna Programme of Action (A/CN.11/89); and In-depth evaluation of the United Nations science and technology major programme (E/AC.51/1990).

were considered to be significant enough in their operational implications to deserve separate treatment in Chapter I, which also explains the report methodology. Chapter II summarizes main findings and lessons. Chapter III reviews the regional setting for science and technology for development and suggests some new approaches in Africa for organizations of the United Nations system. The output evaluation of individual projects is contained in the Annex to this report.

11. The Inspectors record their appreciation to the numerous United Nations system and government officials at Headquarters, regional and country levels who readily shared with them their experiences and expertise on the subject of this report.

I. CONCEPT AND METHODOLOGY

A. The problem

12. The United Nations Intergovernmental Committee on Science and Technology for Development (IGCSTD) adopted in 1983 the following operational guidelines for United Nations system support in the subject area:

(a) Science and technology policies and plans for development;

(b) creation and strengthening of scientific and technological infrastructure;

(c) choice, acquisition and transfer of technology;

(d) development of human resources for science and technology;

(e) financing of science and technology for development;

(f) scientific and technological information;

(g) strengthening of research and development in and for developing countries and their linkage to the production system;

(h) strengthening of co-operation in the field of science and technology among developing countries and between developing and developed countries.

13. The 1987 cross-organizational review of the medium-term plans of the United Nations system noted that most of these plans specifically referred to neither the VPA nor to any of the above eight programme areas intended by the Intergovernmental Committee as a framework for the system's science and technology efforts. While the review registered an ever-growing volume of United Nations system science and technology activities, it stressed the lack of "common understanding within the United Nations system of what constitutes science and technology for development activity and, more specifically, the necessary characteristics it should entail for building endogenous scientific and technological capacities of the developing countries. The search for a comprehensive conceptual definition for science and technology for development is likely to remain elusive, since the concept does not lend itself to easy interpretation and delineation" (E/1987/51, paragraph 93).

14. The end-of-decade review of the VPA, published in 1989 by the United Nations Centre on Science and Technology for Development (UNCSTD), arrived at a similar conclusion. Some of the different conceptual approaches within the United Nations system are the following:

15. The General Assembly of the United Nations, like the VPA itself, lays emphasis on endogenous capacity building and strengthening, which it defines as the capacity to choose, acquire, adapt, utilize and innovate technologies, including new ones, through institutional mechanisms for technology assessment in the areas of priority action (General Assembly resolution 44/14).

16. The Food and Agriculture Organization of the United Nations (FAO): Developing countries need to generate both relatively unsophisticated technologies (e.g., improved farm tools, simple irrigation systems, planting of indigenous crops and trees for soil and water conservation) and high level technologies, or at least have access to them (e.g., biotechnological methods of gene manipulation). Priority needs to do so include: well-trained research workers imbued with the importance of developing technologies appropriate to local conditions; workshops and laboratories adequately funded: strong links and co-operative arrangements with other research centres: attention to socio-economic research and "second-generation" problems, e.g., technologies for sustainable agricultures, effects of technological innovations on income distribution (Agriculture: Towards 2000, 1987).

17. The United Nations Conference on Trade and Development (UNCTAD) and the World Intellectual Property Organization (WIPO): Technology is systematic knowledge for the manufacture of a product, the application of a process or the rendering of a service, whether that knowledge be reflected in an invention; an industrial design, a utility model; a new plant variety; in technical information or skills; in the services and assistance provided by experts for the design, installation, operation, or maintenance of an industrial plant; or for the management of an industrial or commercial enterprise or its activities. (TD/CODE TOT/47 and WIPO No. 620(E)).

18. United Nations Centre on Transnational Corporations (UNCTC): Technology is the stock of knowledge which permits the introduction of new or improved machinery and equipment, products, processes and services. In a wider sense, technology includes additional elements, such as management and marketing skills. Technology therefore takes a number of different forms, including "hardware", such as machinery and equipment; software, such as blueprints, formulae or process specifications; and the services of technicians and professionals for quality improvements, management and marketing know-how, process and product design, etc. (ST/CTC/89). UNCTC illustrates its definition with the chart on page 7.

19. The United Nations Industrial Development Organization (UNIDO) uses a very similar definition, distinguishing between embodied technology (i.e., industrial machinery and equipment) on the one hand, and disembodied technology (i.e., know-how, experience, managerial and organizational skills) on the other. UNIDO, like UNCTC, sees in each technology an integrated software-hardware package.

20. The International Telecommunication Union (ITU) underlines the following steps necessary to achieve endogenous scientific and technological capabilities. First, it is essential to develop the human resources with the capacity to conceive, research into, design and develop a technology. Sound basic education at primary, secondary and tertiary levels is often essential with some specialization at tertiary level. Secondly, there must be sufficient incentives in developing countries to retain the trained manpower to avoid reverse transfer of technology. Thirdly, more financial inputs should be injected as required to sustain endogenous capability building. ITU also highlights the diversity in technologies, pointing out that it is easier, for example, to develop endogenous farm implements than to develop endogenous telecommunications equipment where the technology is changing at breath-taking rate (contribution to the VPA End-of-Decade Review).

21. The Economic and Social Commission for Asia and the Pacific (ESCAP): Technology can be disaggregated into four embodiment forms, namely: object-embodied technology (facilities or technoware); person-embodied technology (abilities or humanware); document-embodied technology (facts or infoware); and institution-embodied technology (framework or orgaware). ESCAP adds that "any resource transformation can take place only when -all four components of technology are present at a certain minimal level. Facilities need operators with special abilities, abilities have to be strengthened gradually from operation to improvement and generation of facilities. Facts representing accumulated knowledge need to be updated regularly, while the frameworks have to continually evolve to meet changing requirements" (Technology Atlas Project, Volume I: An Overview).

22. The United Nations Educational, Scientific and Cultural Organization (UNESCO) generally uses science and technology in their broadest sense to include rational, engineering, social and human sciences, and considers research and experimental development to constitute the "hard core" of the scientific and technological system (CA/5, 1990).

23. The International Labour Organisation (ILO) emphasizes the acquisition and utilization of labour skills, and considers the development of endogenous capacity in science and technology to be the summation of three distinct and fundamental processes - the nurturing of individual skills; the assembling of persons having those skills into effective organizations; and the infusing of those organizations with zeal and purpose. The foundation is laid by primary schools with a technical core to their syllabus, with an upward movement along the ladder of technical competence and the gradual establishment of technical universities, vocational schools, producers' co-operatives, technology-generating organizations, well-co-ordinated bodies and finally the commitment of societies to egalitarian socio-economic growth. The ILO adds that endogenous capacity building has to precede the introduction of new technologies to facilitate their effective utilization (A/CN.11/1991/CRP.1). In its comments on the draft of this report, ILO further stresses that technology generation, acquisition, transfer and diffusion are often influenced by macro-economic policy incentive schemes, price distortions, economic liberalization and structural adjustment policies.

UNCTC : Elements of a Typical Technology Transfer Package

TECHNOLOGY			
Process technology	Product technology	Management technology	Quality control
1. Determination of the type of processing to be used. 2. Identification of economically and technically efficient machines and tools required. 3. Raw materials specification. 4. Pland and design layout 5. Identification and organization of blueprints, specification sheets, operating manuals etc. of all sub-systems. 6. Cataloguing the documents, checking for text completeness, translating them for local use.	1. Product specification. 2. Product design. 3. Identification of locally produced equipement and materials, and adapting them.	1. Personnel management: • skill identification • training • motivation • design of rewards and penalties. 2. Financial management: • monitoring sales • prioritizing capital • spending • managing revenue expenditures • distribution of dividends • generating financial data useful for management decisions. 3. Marketing management: • processing information to guide product development and production planning 4. Training of sales personnel.	Ensuring appropriate design and standards of • materials • equipement • end products.

These issues are covered later in this report.

24. The World Health Organization (WHO): Technology needs to be reappraised and developed for protecting and promoting the health of people of all categories and ages, including specific population groups such as young people, workers and the elderly, special attention being paid to vulnerable groups. No civilization has been able to eliminate disease whatever the measures taken; so technology for the prevention and cure of disease is highly important and is likely to remain so. This includes technology for diagnosis, treatment and rehabilitation in general, as well as for the prevention and control of specific groups of diseases (Science and Technology Programme, Eighth General Programme of Work: 1990-1995).

25. United Nations Fund for Science and Technology for Development (UNFSTD) raises the very pertinent question of the unique and special nature of science and technology projects as opposed to technical assistance at large, and wonders whether there should be separate and distinct criteria for science and technology projects. UNFSTD has nonetheless established its own framework for science and technology projects, including science and technology strategies, technology innovation and entrepreneurship, technology information and quality control. In the view of UNFSTD, the lack of a common understanding amongst the organizations in science and technology matters is of little consequence as long as activities with an essential science and technology dimension are properly embedded in their sectors and follow basic principles underlying all technical assistance projects, the three most important of these principles being capacity-building, institution-building, and sustainability (UNFSTD comments on the draft of this report).

26. These different conceptual approaches obviously stem from the organizations' constitutional or sectoral mandates, which also define the spectrum and substance of their science and technology programmes. This can be illustrated by the following typology adapted from document A/CN.11/84.

	Type of organization	Examples
(a)	Highly specialized	IAEA, ICAO, IMO, ITU, WIPO, UPU
(b)	Broadly sectoral	FAO, WHO, UNIDO
(c)	Intersectoral	ILO, UNCTAD, UNESCO, UNCTC
(d)	Funding	UNDP, UNFPA, UNICEF, IFAD, IBRD
(e)	Promotional and co-ordinating	UNCSTD, Regional Commissions

27. While it may be argued that these statutory differences of approach can be conducive to creative, mutually reinforcing complementarities at the various levels of the United Nations system's interventions in support of capacity building in the developing countries, available evidence tends to suggest otherwise. Indeed, the eight operational guidelines listed in paragraph 12 above are hardly used to instil inter-agency coherence at the programming and operational levels. Moreover, during its ten-year existence the ACC Task Force on science and technology was unable to develop modes of engagement for the system as a whole in its support

for endogenous capacity building in regions and countries at differing levels of development or technological endowment.

28. The absence of a single common science and technology framework within the United Nations system hinders meaningful cross-organization evaluation, reporting and comparison of science and technology programmes and projects. This difficulty is moreover further compounded by the fact that technology may mean different things to different countries, developed and developing. According to UNESCO most countries restrict the concept to applied or engineering sciences while some others adopt a holistic approach inclusive of the social and human sciences - as does UNESCO. All these differences of nuance or emphasis within the United Nations system, and among the donor and recipient countries, illustrate the size of the conceptual problem involved.

29. Equally problematic is the concept of technology transfer. Much of the United Nations system literature on the subject suggests that the concept is used quite broadly to include virtually all technical co-operation inputs such as experts, equipment, meetings of all types, distribution of scientific and technical information, etc. Two things are generally emphasized, namely the stock of inputs including their financial value, and channels or modalities for these inputs under conventional technical co-operation approaches of the System.

30. What is not usually clearly apparent is the dynamic, interactive technology transfer process in terms of outputs, their diffusion and linkage to the productive sectors or end-users, which make for endogenous capacity building as stressed in the VPA and General Assembly resolutions. In this connection, UNCTC's concept of technology transfer as being the acquisition of technological mastery from foreign sources (emphasis added) appears more appropriate than the input preoccupations of most organizations of the system. Referring to private sector experiences, especially in technology transfer negotiations and contracts, UNCTC observes that from a corporate recipient's point of view, it is not sufficient that the individual employees fully absorb the imported technology; a successful transfer for a private sector enterprise additionally requires that the imported technology be embedded as part of the corporate system such that the departure of any individual employee will not deprive the firm of the imported technology (ST/CTC/SER.A/6 and ST/CTC/86).

31. This private sector concept of technology transfer seems to the Inspectors to be more fully consistent with the approach required for United Nations system organizations in their efforts to contribute to endogenous capacity building in the developing countries, as prescribed by the VPA, General Assembly resolutions and the guidelines of the Intergovernmental Committee.

32. More generally, moreover, this concept of technology transfer perfectly squares with the still valid guidelines set forth in 1975 by the General Assembly in resolution 3405(XXX) on "New Dimensions in Technical Co-operation" which provides in essence that: "The basic purpose of technical co-operation should be the promotion of self-reliance in developing countries by building up, inter alia, their

productive capability and their indigenous resources and by increasing the availability of managerial, technical, administrative and research capabilities required in the development process .... and that "Technical co-operation should be seen in terms of output or the results to be achieved, rather than in terms of input ..." (paragraph e(i) and (iii) of the annex to General Assembly resolution 3405 (XXX).

33. Accordingly, the Inspectors consider that endogenous capacity building in science and technology should ideally form the very core and central objective of all United Nations system technical co-operation programmes and activities at all levels of intervention. In this regard it needs to be stressed that the science and technology concept used throughout this report, and which is adapted from the UNCTC concept (see paragraph 18), views technology as an integrated package of software and hardware encompassing production, transformation and marketing skills, organization, management and quality control know-how, scientific, technical and management information. The report's focus on institution-building projects can therefore be explained by the fact that, to be effective and sustainable in their institution-building processes and outputs, such projects should ideally be functionally polyvalent, integrating in one package most if not all of the technological elements mentioned above.

B. Methodology

34. At the outset of the study each executing agency was requested to propose two or three of its completed or on-going science and technology institution-building projects in different regions and at different geographical levels, and to provide appropriate documentation on each project proposed. The Inspectors also selected at random a number of similar projects from the 1992 UNDP compendium of approved projects. Over 100 projects were desk-reviewed and screened to construct a sample of 36 projects distributed as follows, by geographical level: 2 global, 19 intercountry, and 15 country projects; and by region: Africa 16, Asia and the Pacific 10, Latin America and Caribbean 10. The 36 projects were implemented by 22 executing agencies of the United Nations system, some agencies implementing two or three projects in different regions. Most of the projects were operationally active between 1980 and 1992. Close to half of the projects had more than one phase. All but two projects were externally financed mainly by UNDP, besides government counterpart funding.

35. On the basis of the desk review and project sample, the Inspectors prepared a detailed project assessment checklist which was sent to each executing agency to complete for each of its sampled projects. The checklist requested information on concrete project outputs or contributions under the following ten institution-building functions:

(a) Scientific and technological awareness of specific target groups (e.g., policy and decision makers, targeted communities, etc);

(b) legislations, policies and strategies at any level;

(c) research and Development (including Science and Technology products, innovations, inventions, patents, etc. attributable to the project as well as their practical industrial applications in the socio-economic sectors, the specific contributions to research and development by executing agency, etc.);

(d) training or human resource development (including type and mode of training, science and technology density, categories of trainees, relevance and impact of training within the project's socio-economic context, and man/hours of training provided by regular staff of the executing agency);

(e) equipment or hardware (including assessing, selecting, installing, operating and maintaining of science and technology hardware as well as its demonstrated appropriateness to the level of indigenous skills and socio-cultural context;

(f) scientific and technical literature produced and/or acquired by the project, scope of distribution and accessibility to the end-users;

(g) information system (including type and volume of information stored and disseminated, the number and profession of regular users, and linkages with other relevant information systems at national, regional or global levels);

(h) technical backstopping by executing agencies (or applying the accumulated scientific and technical experience of the executing agencies as distinct from the direct inputs of recruited ad hoc project experts) including estimates of the total man/hours devoted to the project by the executing agency's regular technical staff, number and duration of technical missions to project site, technical documentation produced by the regular staff on and for the project, and any linkages still existing between the executing agency and the project after its completion, etc.);

(i) co-operation and interaction (especially with scientific, technological and professional bodies, productive enterprises in the public and private sectors, and other related development programmes and projects supported by United Nations system organizations and other development partners);

(j) overall sustainability of each project (with emphasis on host government(s)' policy and material support, the project's capacity to generate or raise funds and to self-finance its activities, its contribution to reducing institutional costs and to enhancing operational efficiencies in the supported institution, etc.).

36. The checklist was completed for most of the projects, but the degree of completeness and detail varied widely from one executing agency to another. Detailed field investigations were conducted in the course of 1992 for all but one of the 16 projects selected in Africa. Information supplied in the checklist for each project was supplemented by findings during visits to project activity sites, discussions with project operators, United Nations system field staff, especially those of UNDP country offices, and government officials. Additionally, the

Inspectors reviewed field findings with officials at the Headquarters of some of the executing agencies.

37. Of the 16 projects selected in Africa, ten are intercountry (regional or subregional) five are country-specific and one is a regional component of a global project executed by UNDP. The five country projects are distributed as follows: one each in North Africa (Egypt), East africa (Ethiopia), and Central Africa (Zaire), and two in West Africa (Ghana and Senegal). Virtually all other countries of the region are covered by the sample mostly as participants in the ten intercountry projects selected for review. The sample is deliberately tilted towards intercountry emphasis for two main reasons.

38. Firstly, the African region and the United Nations system have been promoting, since 1980, several regional development strategies and agendas (intersectoral and sectoral) centred on the Lagos Plan of Action, economic recovery and development, structural adjustment programmes, economic integration, transport and communication, industrialization, population control, etc. The Inspectors therefore considered it appropriate to investigate the extent to which the sampled intercountry projects were responsive to those regional development strategies.

39. Secondly, many countries of the region are experiencing political and economic difficulties that have worked adversely on country-specific projects. This unstable transition process did not seem to allow for an objective evaluation of many country-specific activities of United Nations system organizations.

40. The report's findings were derived 50 per cent from field investigations and discussions with project operators and end-users, about 30 per cent from information supplied in the checklist by those executing agencies which completed the checklist and some 20 per cent from desk review of project documentation, especially mid-term and terminal project evaluations. Conclusions from the three sources broadly converged quite often, but whenever findings tended to conflict more weight was assigned to field findings in the evaluation of outputs presented in the Annex to this report.

II. MAIN FINDINGS

41. The overall performance of the sample, as summarized in Figure I, page 14, shows that it fell just below 50 per cent in its realization of institution-building outputs in science and technology on the basis of the ten functions used by the Inspectors (see detailed evaluation in the Annex). The main reason for this rather poor performance is that, although all the projects were described as institution-building, only a few of them assigned importance, either in the design or actual implementation process, to the various functional elements that should ideally be incorporated into an institution-building project in a typical developing country.

42. Several more specific reasons may explain the projects' limited spectrum of action. Firstly, the Inspectors noted in the course of this study that there was hardly any awareness, either at the level of the executing agencies or field project management, about the operational guidelines adopted in 1983 by the IGCSTD for use by the organizations in their support for endogenous science and technology capacity building in the developing countries. The ten functions used by the Inspectors to evaluate outputs have been derived and adapted essentially from those guidelines. Project results suggest that counterpart government agencies and United Nations system executing agencies may not have a precise idea of what it takes to nurture endogenous science and technology capacity building.

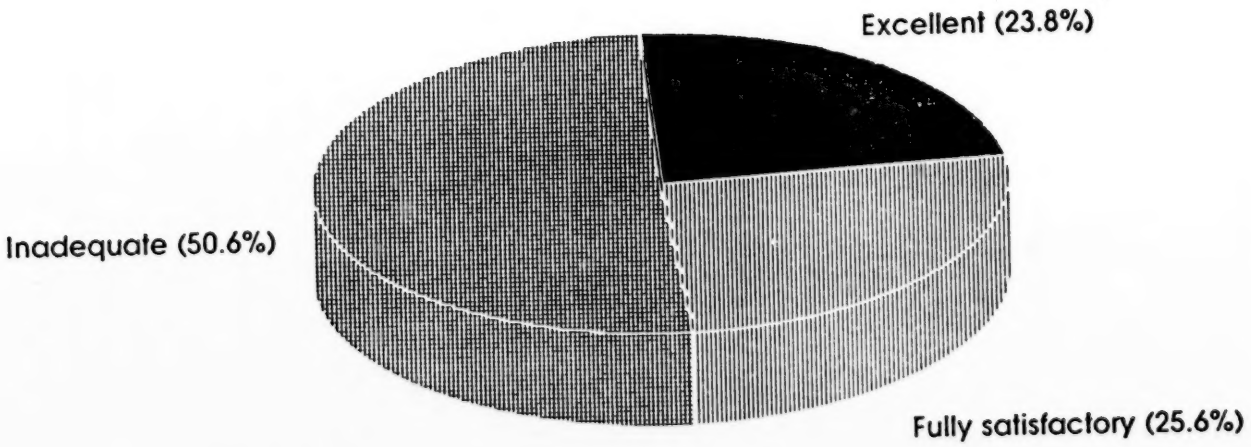
43. Secondly, a comparison of the sampled projects in Africa with those in Asia and Latin America suggests that project design and implementation processes and modalities tend to be mechanically cast in very much the same pattern, with little or no adjustments to the project's socio-cultural milieu, available science and technology capabilities or level of development of the country or region concerned. A typical developing country and particularly the least-developed countries, which are concentrated in Africa, would normally require institution- building projects with as many as possible of the ten functions used by the Inspectors.

44. Thirdly, very little attention was given by some of the projects to the crucial issue of the sustainability of the supported institutions. If preproject or prefeasibility analyses had been done of the long-term financial, technological and institutional viability of the projects or institutions they were intended to support, the analyses would have no doubt revealed the need for project strategies with an optimal mix of institution-building objectives. Virtually all the successful projects of the sample had clear-sighted multipurpose strategies, and all but two of them had all the marks of self-reliance. Additionally, hardly any prior analysis was made of the long-term financial capacity of the host government(s) to support the projects as a condition for United Nations system involvement. The inability of the participating countries to fulfil their financial commitments adversely affected most intercountry projects.

45. Fourthly, very few projects in the sample were deliberately designed and executed as an integral part of a broader programme at the national and/or regional level. A programme-oriented strategy obviously would incorporate most if not all of the ten institution-building functions. However, as found out by the Inspectors,

Figure I

Overall Sample Performance



such an approach was constrained by the general practice of the executing agencies to tailor project objectives to the amount of funds available for implementation within a specific time frame, rather than to a broader programme context often requiring open-ended continuity of financial and technical inputs. At any rate, the wisdom of the programme approach recommended by the General Assembly in resolution 44/211 is amply confirmed by the findings of this report.

46. Finally, differences in the operational and output performance of the projects were quite illustrative of conceptual and definitional variations within the United Nations system regarding science and technology for development activities and the desirable elements they should entail for building endogenous science and technology capacities in the developing countries (see Chapter I. (A)). Thus the absence of a United Nations system common understanding and framework in this subject area has certainly contributed to the uneven output performance of the sampled projects.

47. Performance by project: The Table on page 16 rates the output and impact of each project under the 10 institution-building functions used for the evaluation. Each function is assigned a value of 10 percentage points for excellent score (horizontal column (a)) and 6 percentage points for fully satisfactory performance (horizontal column (b)). As an example, a project rated excellent for 5 functions (50%) and fully satisfactory for 5 others (30%) achieves an overall rating of 80 per cent. Horizontal column (c) indicates the number of functions rated inadequate or not applicable for the projects shown in that column. Figure II (page 17) ranks the projects in descending order of performance.

48. The final tally shows that only 7 projects (44 per cent of the sample) were clearly successful in their combination and performance of the 10 functions used by the Inspectors. However, three projects shown as performing poorly, namely EMST, RMTA and SGMC, were in fact not failures in the judgement of the beneficiaries and host government officials. The three projects focused rather sharply on specific objectives which were implemented successfully even though other desirable institution-building elements received little or no emphasis.

49. The seven projects scoring over 50 per cent point up some major lessons. Firstly, they reflected full mastery by the project designers and implementors of the respective science and technology disciplines concerned, so much so that the combination of various institution-building functions served effectively to enhance the projects' objectives and multiplier effects. This was remarkably evident for ARCEDEM in engineering design and manufacturing, for ESIPS in industrial property, and for IDSC in management information technology. ESIPS tops the sample in terms of thorough design and execution. It skilfully combined and performed all the ten functions used by the Inspectors, scoring excellent six times and fully satisfactory four times. It was the only project with no negative score. In the case of AGRHYMET and ARCT, the combination of functions was quite appropriate, but tended to blur rather than enhance their ultimate goals.

TABLE

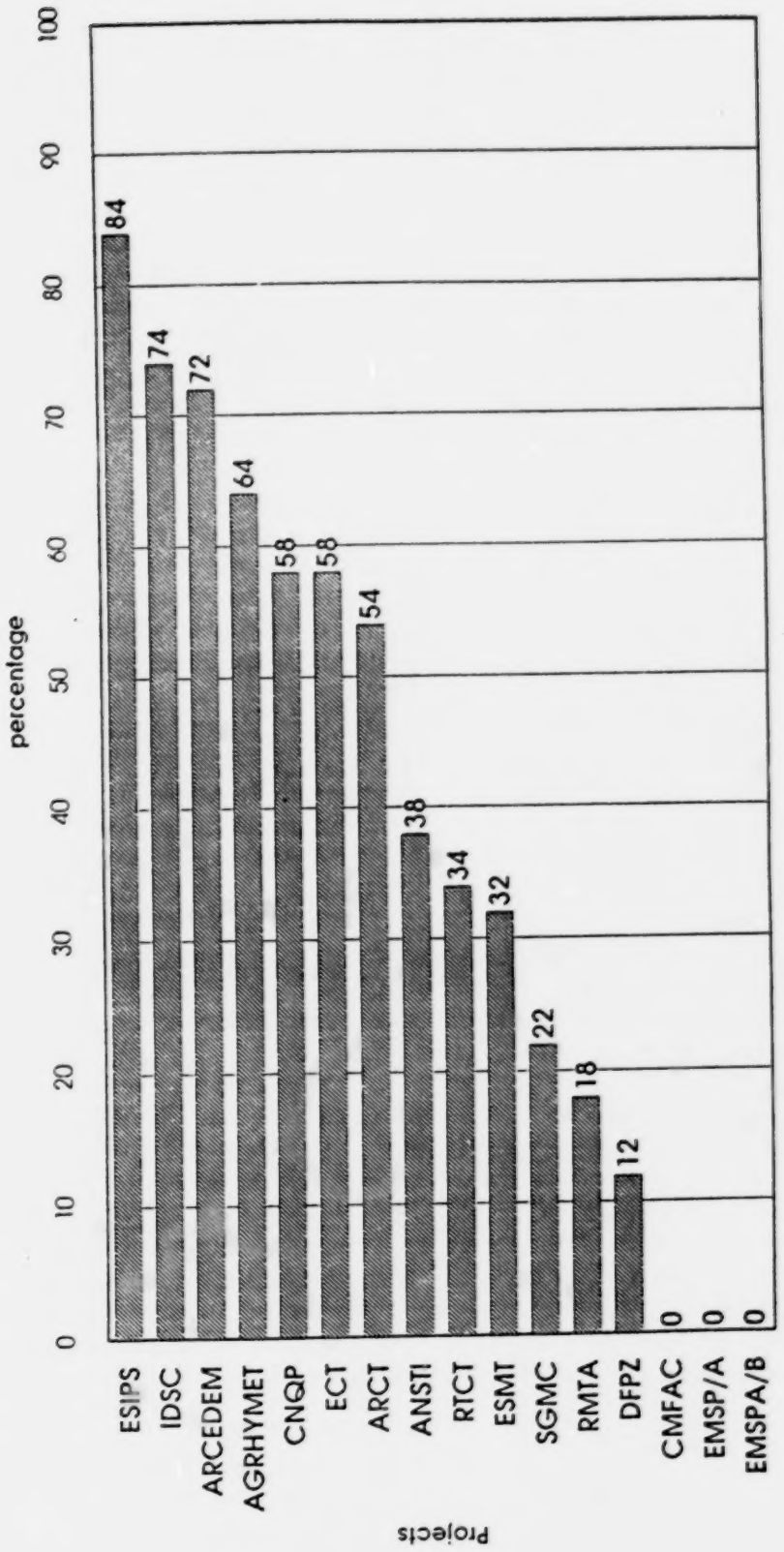
PERFORMANCE BY PROJECT

Number of scores *	1	2	3	4	5	6	7	8	9	10
(a) Excellent	RTCT SGMC	ANSTI ESMT	ARCT	AGRHYMET ECT CNQP	IDSC	ESIPS ARCEDEM				
(b) Fully satisfactory		ARCEDEM SGMC DFPZ ESMT	CNQP ECT RMTA ANSTI	ARCT ESIPS IDSC RTCT AGRHYMET						
(c) Inadequate or not applicable	IDSC	AGRHYMET ARCEDEM	ARCT ECT CNQP		ANSTI RTCT	ESMT	RMTA SGMC	DFPZ		CMFAC EMSP/A EMSP/B

* The horizontal column with figures 1-10 should not be confused with functions A-J in the Annex. Figures 1-10 indicate the number of times each project was rated excellent, satisfactory or inadequate under each of the functions used for the evaluation in the Annex.

Figure II

Ranking of Projects by Performance



50. Secondly, the strong and abiding commitment of the executing agency was seen to be a major factor of success (CNQP, ECT in its first phase, ESIPS and IDSC). In this respect, WIPO delivered a near-perfect performance with respect to ESIPS, outperforming by far all the other executing agencies concerned by the sample. The Department of Technical Co-operation for Development (DTCD) (for DFPZ), the Economic Commission for Africa (ECA), the International Civil Aviation Organization (ICAO) and the Universal Postal Union (UPU) performed rather poorly. The projects executed by ICAO (CMFAC) and UPU (EMSP/Abidjan and Brazzaville) failed mostly because the original assumptions which had justified the creation of the supported institutions, such as financial support by participating countries or the manpower needs of potential end-users did not materialize. ARCEDEM and ARCT performed successfully thanks in great part to the technical competence and dedication of the directors and staffs of the two centres.

51. The general practice by the executing agencies to appoint a Chief Technical Adviser (CTA) and abdicate to him or her the technical support functions devolving to them under project agreements, was found to be counterproductive and wasteful of scarce project resources. A well-established institution supported by a United Nations system project should, for example, not need a Chief Technical Adviser whose role would duplicate that of the institution's technical management.

52. ARCEDEM, ARCT, ESMT and RMTA which were practically implemented by the directors of the supported institutions, clearly did not warrant the appointment of Chief Technical Advisers, and were therefore eligible for "national execution" without forfeiting their direct links with co-operating agencies of the United Nations system. Chief Technical Advisers are not always fully conversant with United Nations system technical co-operation policies. Equally important, they may not always carry the flag of neutrality and independence, which is highly valued by host governments in their technical co-operation with United Nations system organizations. The Chief Technical Advisers thus appear like an awkward and costly substitute for the required direct involvement of the executing agencies in steering project activities.

53. Thirdly, most of the successful projects were notable for their interactions with the socio-economic environment. This factor significantly enhanced the overall economic benefits of the projects relative to their costs. It can be estimated for example that IDSC contributed to induce savings in the various public and para-public services of Egypt worth over ten times the project's overall cost. Such quantifiable achievements could be more widely used to measure the cost-benefit value of United Nations system-supported projects. The economic benefits of ESIPS appeared too early to gauge, but they would certainly have been substantial had the project been tailored more specifically to individual productive sectors.

54. Fourthly, the projects' institutional costs were low relative to programme costs and outputs, with the exceptions of AGRHYMET and to some extent ARCT. The AGRHYMET Centre was noteworthy for its institutional complexity, which featured about 20 Divisions and 10 supervisory layers at the time of field

inspection. This complex set-up appeared to weigh heavily on the financing capacity of the participating countries (all LDCs) and to cast doubt on the ultimate endogenous sustainability of AGRHYMET itself upon the termination of external funding.

55. Project performance by geographical level (national, intercountry and global) revealed overall weak financial support for intercountry institutions by the participating governments, excepting the governments hosting these institutions. This was one of the main causes for the complete collapse of CMFAC and ESMP/Brazzaville, and for the persistent difficulties of ESMP/Abidjan and ARCT for example. Despite this drawback, however, regional projects did not perform any worse than the few national projects included in the sample, and some projects, ARCEDEM in particular, used the drawback as justification for a self-financing and self-reliant strategy. Sound management of the intercountry institutions plus the factors enumerated in the foregoing paragraphs, were generally more decisive to the success of the projects than their geographical level.

56. Performance by technological discipline also revealed little worthy of note. However, ESIPS heightened awareness about the significant economic benefits likely to result from the organized ability to access, source and apply technological information contained in patent documentation. IDSC demonstrated the vast potential economic benefits that an automated management information network can have for the national administration and allied services in the developing countries, particularly in terms of functional efficiencies, transparent systems of accountability, reduction of red tape, duplication and graft. Both projects point to possible future areas of emphasis, among others, for science and technology endeavours in the African region and least developed countries.

III. REGIONAL SETTING AND ROLE OF THE UNITED NATIONS SYSTEM

A. Regional setting

57. Science and technology development is evidently conditional on many crucial factors, the foremost probably being political. Socio-economic development in general and science and technology in particular must, in the first instance, be politically willed and politically steered towards long-term national goals. That in turn requires vision, societal consensus, discipline and stability as well as an appropriate system of national priorities. It was evident throughout this study that institution-building in science and technology for development in Africa was generally inhibited because some of these prerequisites are yet to be fulfilled in many countries.

58. As aptly summed up in the United Nations New Agenda for the Development of Africa in the 1990s: "Peace is an indispensable prerequisite for development. The end of the cold war has opened up opportunities for the peaceful resolution of conflicts and for the intensification of international co-operation for development, particularly with Africa. Peace initiatives by African countries should be encouraged and pursued in order to bring an end to war, destabilization and internal conflicts so as to facilitate the creation of optimal conditions for development".

59. The current wave of political reforms in the region aimed at more liberal, democratic and decentralized systems of governance, coupled with United Nations efforts to resolve internal conflicts, and strengthen or rebuild political and economic structures that underpin domestic peace and security, hold out the prospect that Africa will sooner or later achieve the optimal political conditions for its develoment in general and for science and technology capacity-building in particular.

60. In addition to a conducive political context and commitment, sharp awareness is also necessary about the fundamental role of science and technology in the modernization of societies and in nation-building. Only now is that awareness beginning to take hold thanks partly to the Conference of African Scientists held in Brazzaville in 1987, to the work of the African Conference of Ministers for Science and Technology and to the valuable efforts of ECA and UNESCO at the regional level. But that awareness needs to be developed even further to the summit level of the Organization of African Unity in view of the significant difference that appropriate science and technology policies, institutions and infrastructures could make in the development of the region.

61. Another prerequisite concerns incentive policy frameworks for domestic and direct foreign investments that create science and technology infrastructures and employ indigenous science and technology resources and skills. The present evaluation of science and technology institution-building in Africa confirms a truism already underscored in other regions, that science and technology development is best engineered and diffused by a vibrant private sector operating within a

stimulating environment of economic liberalization, efficient infrastructures and services.

62. This precondition also is now more keenly and widely recognized in the region than in the past as most countries have embarked on wide-ranging economic liberalization programmes, assisted notably by the IMF and the World Bank. However, the unprecedented nature of the region's economic depression, together with the shock-therapy programmes of structural adjustment, which are further compounded in some countries by political transition difficulties, have wrought damage on fledgling local science and technology institutions and capacities, amplifying the reverse transfer of technology to the developed countries through brain drain. In these circumstances, present economic reforms designed to create an incentive economic setting for domestic and foreign investment, would appear to be in the balance in parts of the region.

63. Another prerequisite for the region concerns the eradication of illiteracy and innumeracy, and the systemic build-up of vocational and technical skills along the entire spectrum of the national production system. Science and technology can hardly be developed and effectively propagated in a predominantly illiterate society. Literacy and functional literacy in particular facilitates the assimilation of basic practical skills that in turn can be honed into technical skills and so forth up the ladder of science and technology development and mastery. Literacy in addition lays the cultural foundation for the creation of a science and technology mentality or for the modernization of value structures and attitudes that are receptive to science and technology development and conducive to the productive management, operation and maintenance of the stock of science and technology capital.

64. Therefore, educational policy reforms in Africa clearly deserve the same attention and support as political and economic reforms. Past emphasis on purely elitist strategies giving disproportionate priority and resources to higher education now appear, by hindsight, to have been misguided. Priorities would need to revert to the natural base of production with emphasis on functional, development-geared literacy campaigns and programmes, as well as on vocational and technician education and training policies from primary to secondary level, the objective being to create skilled manpower in the various economic sectors. Higher science and technology education should emphasize quality rather than quantity and should be integrated to the maximum extent with the national production system.

65. Sound socio-economic development in general is catalyzed by yet another agent: an efficient, dependable and accountable public service which manages the national weal, including science and technology resources, and contributes to enhance or mar a nation's investment and credit worthiness. The prerequisites outlined above may therefore need to be complemented where necessary by significant rationalization of public services in order to create an optimal environment for investments that stimulate the transfer, adaptation and dissemination of technologies. In this respect, the IDSC project has demonstrated the multiple benefits that can be derived from the application of organization and

management technologies in national administrations to streamline and expedite decision-making and administrative processes, simplify information flow and paperwork, modernize and strengthen accountability systems, and discourage mismanagement.

66. The foregoing paragraphs point to some possible new directions for a co-ordinated United Nations system approach that could have a significant impact on Africa's development process and science and technology capacity building.

B. Role of the United Nations system

67. Organizations of the System are currently more extensively involved in Africa than in any other developing region of the world. In 1992, for example, out of the 24,000 United Nations system personnel active in the developing regions, 13,700 or 57 per cent were in Africa, compared to 7,000 (29 per cent) in Asia and the Middle East and 3,300 (7 per cent) in Latin America and the Caribbean. In the same year, Africa's share of the organizations' total resources for operational activities for development amounted to US $ 2 billion (including humanitarian aid), or close to half of the global figure, while credits by the World Bank, IMF and IFAD amounted to US $ 5.2 billion. UNDP is currently financing over 2,000 projects in Africa, and multilateral aid represents over 50 per cent of the total development resources at hand in some LDCs of the region. On the other hand, it is estimated that African countries spend about US $ 4 billion each year to pay for thousands of development experts from all sources employed in the region.[2] However, the Inspectors could not verify the accuracy of this figure.

68. At the policy level, the United Nations General Assembly has devoted a special session to the economic crisis in Africa, and has been promoting since 1980 a number of regional development programmes and strategies of a sectoral and cross-sectoral nature (see paragraph 38), the most recent being the United Nations New Agenda for the Development of Africa in the 1990s. Thus while Africa has in recent years been generally shunned by the global pattern of foreign investment flows, the United Nations system has solicitously strengthened its commitment to the region's socio-economic development.

69. Many African government officials interviewed in the course of this study expressed deep appreciation for the work and abiding solidarity of the United Nations system. The Inspectors noted that the organizations enjoy unqualified credibility and respect in country after country. At the same time, some United Nations system field staff, and UNDP Resident Representatives in particular, were concerned that the system's commendable efforts were making no palpable difference on the African development scene, which has continued to deteriorate inexorably. Field staff who are anxious to show concrete success for their labours believe that, even if the organizations' collective resource allocations to the region

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[2] The African Economic Review, April 1993.

were to be increased manyfold, tangible success might continue to be elusive without a significant rethink of the goals and modes of operation of the United Nations system's involvement in Africa.

70. The Inspectors' findings by and large confirm those views. It was observed in particular that:

(a) the United Nations system's excessive emphasis to date on projects as a vehicle for technology transfer, rather than on continuing technological support to major national and intercountry/regional programmes has, by all accounts, been responsible for the visible lack of impact of the organizations' collective efforts in Africa. The numerous activities of the organizations are moreover ineffectually overstretched on too many fronts, with hardly any clearsighted collective objective. The Bretton Woods Institutions have tended in the past decade to dominate at the policy level with their clearly targeted macro-economic reform programmes;

(b) confusion prevails as to which geographical level - country or intercountry/regional - the United Nations system should collectively concentrate its resources in order to produce optimal collective effect;

(c) the organizations' activities are not concentrated on their individual or common comparative advantage, which could be institution-building in general with emphasis on human resources development at the strategic rather than operational level; building of international coalitions in high priority programme areas (e.g., AGRHYMET for drought control and food production in the Sahel); raising science and technology awareness in the region through expanded communications systems including dissemination of science and technology information; advisory support to governments in the negotiation of international science and technology contracts or preparation and appraisal of feasibility studies. Instead of focusing on these areas, the organizations tend to confuse their global character with omnipotence and omniscience by engaging in all sorts of project activities best left to national governments and the private sector;

(d) there is an across-the-board need for more deliberate collaboration amongst all the organizations around high-profile issues for the region such as economic structural adjustment programmes which are supported by the World Bank and IMF but impact on the activities of all other development partners, or public sector reforms and privatization programmes;

(e) ECA has demonstrated its strongest asset in policy and strategy formulation (e.g., Lagos Plan of Action, the African Economic Community blueprint, or Transport and Communications Decade for Africa). The Commission's involvement in other areas, particularly in interagency programming and operational co-ordination, or project execution, has produced only mixed results at best, partly because ECA's programmes appear overstretched and partly because of limited support by the United Nations system for many of its regional initiatives, especially in the area of institution-building.

(f) the organizations' activities place little or no emphasis on sectoral, national and regional strategies for endogenous generation and proper husbandry of development resources in general and financial resources in particular. United Nations system's development activities are only very rarely integrated or linked with the production system, especially the private sector, including NGOs. A clear policy shift away from external resource mobilization efforts towards endogenous resource creation and utilization strategies would seem indispensable at the present juncture of contracting international development aid;

(g) The organizations' activities are not collectively tied or responsive to the regional development blueprints adopted by governments of the region and endorsed by the United Nations General Assembly for support by all organizations of the System. The report of the Secretary-General of the United Nations entitled: "System-wide Plan of Action for African Economic Recovery and Development" (E/AC.51/1992/5) is in fact, not a plan of action in the conventional, integrated sense, but a mere listing of numerous disconnected activities by individual organizations with no evident common focus for the System as a whole.

71. The Inspectors conclude that the United Nations system should collectively stake its credibility and resources in Africa on a few strategic areas where they enjoy a clear comparative advantage over other development partners. Such areas could include, for example:

(a) co-ordinated policy reform initiatives, which currently seem to be left almost entirely to the Bretton Woods Institutions. The structural adjustment programmes supported by these latter Institutions, with the additional backing of major donor countries, should certainly find room for the active collaboration of the United Nations development system in order to ensure that such programmes are sectorally balanced in their thrusts and intended impacts;

(b) sharpening the awareness of national counterpart departments about science and technology issues through various means, such as briefing sessions and workshops at director level, dissemination of information, study tours, etc.;

(c) building of science and technology policy formulation and institutional capacities, through inter alia specially designed training programmes for senior officials in public and parapublic sectors;

(d) support for national science and technology programmes likely to have a direct impact at the grass-roots level;

(e) proposing efficiency reforms to national public or civil services inter alia through the introduction of more effective systems of accountability and control likely to reduce graft and financial management abuses, or through expanded use of automated management information systems, such as the IDSC project in Egypt;

(f) devising national strategies for increased endogenous creation of resources, notably by developing programmes that attract local and foreign investments.

72. Additionally, the possibility could be considered of establishing a few pilot strategic science and technology institutions each in one of the four economic subregions (North Africa, West Africa, Central Africa and East and Southern Africa) in high priority areas of science and technology development as may be determined within the context of United Nations New Agenda for the Development of Africa. The proposed pilot institutions could be of national or subregional scope and could build either on existing institutions (e.g., ARCEDEM, ARCT or AGRHYMET), or could be built from scratch. The institutions would be supported collectively by groups of United Nations system Organizations concerned with the sector involved in order to test the feasibility of such collaboration, and the diffusion, use and impact of the institutions' products, and to draw lessons for possible wider application in the region.

73. Such institutions could have the following functions and characteristics, amongst others:

(a) serve as engines of science and technology development as well as models of excellence, especially in the development of skilled manpower at the intermediate level;

(b) concentrate in their respective areas of competence on the training of trainers and on the development and implementation of national training policies that emphasize quality standards and appropriate professional attitudes;

(c) engage in research and development activities oriented to endogenous requirements and in the adaptation of foreign technologies to those requirements;

(c) foster subregional economic and technological integration;

(d) promote local production and marketing of technological software and hardware;

(e) collaborate with the production system and the private sector more particularly, by stimulating domestic and foreign investments in science and technology within their sectors of competence;

(f) promote south-south and north-south co-operation through twinning arrangements with similar institutions in the developing and developed countries;

(g) the proposed institutions should aim to be self-financing and even profitable within a specified period of about 10 years pending which they could be linked organically or otherwise to national governments, the United Nations system, African intergovernmental institutions and the donor community;

(h) the institutions should have a substantial degree of financial and operating autonomy within clear accountability guidelines.

Annex

OUTPUT EVALUATION

1. The output of each project under each of the 10 functions proposed in Chapter I is rated excellent if judged by the Inspectors to be clearly within the range of 70 - 100 per cent in its effectiveness and impact; satisfactory if clearly over 50 per cent but below 70 per cent, and other if inadequate or "non applicable" as stated for some functions by the executing agencies in their responses to the JIU questionnaire.

A. Scientific and technological awareness

2. The Inspectors investigated the extent to which each project had contributed within its sphere of activity to raising the awareness of specific target groups effectively or potentially concerned by the project, such as policy- and decision-makers, end-users, relevant public or private institutions, the local, regional or international communities. The sample performance was the following:

Excellent:	3 projects (AGRHYMET, ECT, IDSC)
Satisfactory:	5 projects (ARCEDEM, ARCT, CNQP, ESIPS, SGMC)
Other:	8 projects (ANSTI, EMSP/Abidjan, EMSP/Brazzaville, DFPZ, RTCT, ESMT, RMTA, CMFAC)

3. Although the need to raise the awareness of key groups targeted by project activities was very seldom explicit in project documents, some projects effectively performed that function as a necessary condition for their overall effectiveness and impact. The AGRHYMET project was exemplary in this regard.

4. AGRHYMET, which derives its acronym from the combined prefixes of agriculture, hydrology and meteorology, was established in 1974 as a UNDP-financed project executed by the World Meteorological Organization (WMO), with FAO as associate executing agency. Its objective was, in a nutshell, to alleviate the effects of drought and other climatic changes on agricultural production in the eight participating countries of the Sahel, notably through the training of local personnel and the operational application of agro-meteorological and hydrological information.

5. That objective, born of a perpetual life or death struggle with drought in the countries concerned, had already been given organic shape in 1973 by the creation of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS by its French acronym). Thus from its very inception CILSS incarnated a sharp awareness, at the highest political level, of the historical and potential effects of drought in the Sahel.

6. The AGRHYMET project very skilfully built on that awareness, expanding and sustaining it at all levels and through multiple means to achieve popular

recognition of its developmental goals. The project's early warning function and mechanism operated most appropriately for that purpose. So did its national chapters and ad hoc multidisciplinary working groups integrating in each country the different services concerned by the project. The audio-visual media, and "La Radio Rurale" more particularly, were periodically used to optimal effect to advance the project's goal, so much that, as observed in one participating country, even the police and armed forces were conscious of their role in the collection and transmission of agrometeorological information. The project's newsletter and other publications did not seem to have wide enough circulation and their impact appeared limited.

7. This awareness-raising effort which reached out to the international level translated into several significant results, the most important probably being the sustained strong political and financial backing of the project by the participating governments. Additionally, while in 1974 UNDP was the project's main external source of funds, by 1990 about five bilateral and multibilateral agencies were contributing to the project and broadening its impact in the Member countries.

8. The other two projects which have scored excellent marks for awareness-building, namely, the Ethiopian Centre of Technology (ECT), implemented by UNCTAD, and the Egyptian Cabinet Information Decision Support Centre (IDSC), implemented by the Office for Projects Services (OPS) had the strategic advantage of being lodged in each case at the uppermost political level of government. Their commanding heights, which reflected strong political support, virtually guaranteed for both projects excellent public visibility as well as the firm support of sectoral ministries for their objectives. This was translated into concrete terms in Ethiopia by the transformation of the Centre into the Ethiopian Commission for Science and Technology (ECST) with its sectoral centres and studies, and in Egypt by the introduction of cost-saving efficiency reforms in some government departments, particularly in the customs, energy and manufacturing sectors.

9. Among the projects scoring satisfactory marks under this heading, the significant efforts of the African Regional Centre for Technology (ARCT) deserve a comment. While this project used all possible means (publications, films, advocacy missions to African intergovernmental meetings and its outreach pilot demonstration units) to promote science and technology awareness in its Member countries, those efforts did not seem to crystallize into more tangible political or financial support for its activities. Two projects (the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) in Ibadan, Nigeria, and the "Centre National de Qualification Professionnelle" (CNQP), in Dakar, Senegal) gained adequate visibility through their strong interactions with the private sector.

10. Among the projects judged to have delivered inadequate performance, it should be pointed out that the African network of Scientific and Technological Institutions (ANSTI), based in Nairobi, Kenya, and supported by UNESCO, has issued quite a substantial stock of publications that have contributed to science and technology awareness in the African region. However, not only was this effort limited essentially to the formal publications mode, but it also hardly

extended beyond ANSTI participating institutions. The Inspectors therefore concluded that this effort fell below what could reasonably be expected from the regional mandate and network of ANSTI and the constitutional functions of UNESCO itself.

B. Legislations, policies and strategies

11. The extent to which the sampled projects had contributed to the formulation and application of legislations, policies and strategies in science and technology for development at the national, subregional or regional level can be shown as follows:

Excellent:	3 projects (ECT, ESIPS, CNQP)
Satisfactory:	2 projects (AGRHYMET, IDSC)
Other:	11 projects (ARCEDEM, ARCT, ANSTI, EMSP/Abidjan, EMSP/Brazzaville, RTCT, DFPZ, CMFAC, ESMT, SGMC, RMTA)

12. The Establishment and Strengthening of Industrial Property Systems in Africa (ESIPS), implemented by WIPO, clearly stands out under this heading. As stated by WIPO and confirmed in two countries during field investigations, the project has been instrumental in Guinea acceding to the Bangui Agreement which created the African Intellectual Property Organization (OAPI) and which provides common legislation in intellectual property to OAPI'S 14 francophone Member States (namely, Benin, Burkina Faso, Cameroon, Central African Republic, Tchad, Congo, Cote Ivoire, Gabon, Guinea, Mali, Mauritania, Niger, Senegal and Togo).

13. In addition, according to WIPO, Madagascar enacted its first industrial property law, Kenya enacted a new industrial property law also, as did Lesotho and the Gambia. The United Republic of Tanzania amended its law on industrial property. The following countries acceded to important international treaties, namely, the Convention Establishing the World International Property Organization: Namibia; the Paris Convention for the Protection of Industrial Property: Swaziland; the Bern Convention for the Protection of Literary and Artistic Works: Ghana, Guinea-Bissau and Malawi; the Patent Co-operation Treaty: Cote d'Ivoire and Guinea; the Treaty on the International Registration of Audiovisual Works: Burkina Faso.

14. The ECT project's contribution in this respect was of seminal importance in laying the policy and institutional foundation on which was subsequently built the Ethiopian Government's entire machinery for science and technology for development. The CNQP project in Senegal likewise enabled the enactment of legislation establishing a government department responsible for vocational training. AGRHYMET and IDSC also made significant contributions under this heading. It could not, however, be established with precision whether drought control policies and strategies in the Sahel, or the five-year information management plan adopted by the Government of Egypt in 1988 as well as its customs reform legislation, should be credited directly and exclusively to AGRYHMET and IDSC projects respectively. Their contributions, while substantial, appeared rather like confluents of converging initiatives.

15. The output performance of ARCT and ANSTI, which have an explicit mandate to assist governments of the region in the formulation of science and technology policies, strategies and plans of action, was rated inadequate not so much because they have spared any efforts in this area as because their distinctive achievements were hardly verifiable. This is the more so as their mandate under this heading clearly overlaps with the objectives of ECA'S and UNESCO's science and technology programmes.

C. Research and Development

16. The contribution of the projects to research and development in the search for endogenous solutions to the socio-economic development problems of the region was evaluated as follows:

Excellent:	2 projects (ARCEDEM, ESIPS)
Satisfactory:	3 projects (ANSTI, ARCT, RTCT)
Other:	11 projects (ECT, EMSP/Abidjan, EMSP/Brazzaville, AGRHYMET, DFPZ, CMFAC, ESMT, SGMC, RMTA, CNQP, IDSC)

17. The African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) can be credited with the best research and development performance, partly because this function constitutes the very core of its mandate and partly because of the proven competence of its technical staff. The Centre has so far developed equipment designs and manufactured about 50 prototypes of agricultural, food processing, industrial and construction machinery which the Inspectors judged to be most appropriate to the indigenous needs and level of technological skills in most countries of the African region. The products are intended essentially for use by small scale industries and farmers' co-operatives. The Centre also designs and manufactures spare parts, tools, jigs and fixtures for the rehabilitation of automobiles and industrial equipment and processes.

18. The Centre's overall output has the unique benefit of contributing to reduce importation of expensive equipment items and spare parts, thus resulting in foreign exchange savings sorely needed in Africa. While it has established similar centres in some countries, such as Congo and Rwanda, and has done a good job of disseminating some of its products, the Centre's impact is mostly visible at present only in Nigeria, the host country, where many small and some large manufacturing concerns are successfully applying its products. This success clearly needs to be expanded to other countries through the establishment of, or linkages with, more national engineering design and manufacturing units, coupled with more intensive dissemination of the Centre's research and development products to the private sector.

19. The project establishing and strengthening industrial property systems in Africa (ESIPS) likewise resulted in some notable achievements, including the creation of inventors' associations in some countries and the establishment of the African Federation of Inventors Associations. WIPO reports that, during the active

period of the project, (1987-1991), 440 requests were received from African industrial enterprises and research and development institutions for state-of-the-art reports, compared to 490 similar requests during the 11 years preceding the project. This comparison, together with the creation of inventors' associations, testify to ESIP's significant contribution to stimulating and strengthening the research and development function in Africa.

20. The African Regional Centre for Technology (ARCT) and the Root and Tuber Crops Technology project (RTCT) have not been rated excellent in their research and development performance mainly because their outputs, while definitely substantial, have found only limited application thus far in the productive socio-economic mainstream of the region. ARCT must indeed be commended for establishing pilot and demonstration units (PDU's) in several countries, such as for biogas production in Liberia, Morocco, Nigeria, Senegal, Sierra Leone, Togo and Tanzania. Food processing PDU's have also been set up in Ghana, Kenya, Senegal and Zambia.

21. These research products are generally well-targeted to the priority needs of the rural sector, as demonstrated in Senegal, host country of the Centre. But their absorption into national production systems has proved clearly difficult in the absence in many countries of the necessary instrumenting infrastructure for industrial production, marketing and distribution of the products. This can be possible thanks to the strong involvement of the private sector operating in a macro-economic context that stimulates entrepreneurship and investment, local and foreign. Until very recently, however, ARCT had been rather more inclined to working with governmental or parapublic institutions which establish policies and norms, but hardly industrialize research and development results.

22. Additionally, many of ARCT's designs and prototypes, especially in food processing machinery, duplicate similar outputs by ARCEDEM. There is as such little or no evident complementarity between the two sister institutions in the pursuit of their respective mandates. This comment applies equally to ANSTI whose research and development efforts in food processing technologies also overlap with what ARCEDEM is already doing with excellent results. A sharper redefinition of roles on the basis of the demonstrated comparative advantage of each institution would therefore be in order.

23. Like ARCT, the global project on Root and Tuber Crops Technology (RTCT), implemented in Africa by the International Institute of Tropical Agriculture (IITA), based in Ibadan, Nigeria, has turned out a significant amount of research and development products. Their propagation has, however, been limited by inadequate national conveyor structures. The project has national chapters in Cameroon and Zaire, supported in Cameroon by the Institute for Agronomic Research (IRA) and in Zaire by the National Programme of Applied Agricultural Research and Propagation (SENARAV). The testing and practical application of researched varieties (cassava, yams, cocoyams, etc.) are conducted in Cameroon through provincial outreach Testing and Liaison Units, and in Zaire through pilot development projects implemented by about 60 national non-governmental

organizations at the intermediate and local levels.

24. The significant investments in research and development and related training by the host governments, IITA and a consortium of donors including particularly the World Bank and USAID, have regrettably not been translated effectively into national farming systems in both countries for a variety of reasons, including especially:

(a) The absence of national incentive policy and structural frameworks linking research and development to propagation and production strategies as well as to produce processing and marketing;

(b) rudimentary or non-existent farm to market roads, coupled with the scarce transportation means available to farmers and extension services;

(c) limited seed-stock multiplication enterprises as well as post-harvest management know-how and facilities, with post-harvest losses rising as high as 50% of total produce in parts of Cameroon and Zaire;

(d) inadequate involvement of the private sector generally due especially to the limited number of medium-sized and industrial farming ventures which are ideally suited for high-tech applications to agriculture, coupled with the dearth of food processing industries;

(e) declining government support as a combined result of national economic difficulties and structural adjustment programmes;

(f) limited operational collaboration in Cameroon between the Ministry responsible for science and technology which oversees IRA, and the Ministry of Agriculture which oversees extension services.

25. The Inspectors observed during field investigations that the compound effect of these shortcomings had sapped the original motivation of research and development staff and virtually ruined their fledgling infrastructure in both countries. The lesson is that a thorough pre-feasibility study should have preceded significant research and development investments under the RTCT project in the two countries in order to establish the case for stronger and better-managed vertical and horizontal linkages to the production system, as well as the long-term sustainability of the project's outputs at the level of the targeted beneficiaries.

26. One major finding shared by all the sampled projects with research and development components is that hardly any attention is given to the need to patent their inventions or to consult patent documentation relevant to their research and development disciplines. The Cameroon Institute for Agronomic Research, for example, which has developed some indigenous food processing technologies, is located in Yaoundé which is also the seat of the African Intellectual Property Organization (OAPI by its French acronym). However, IRA officials did not seem

to know much about this organization or even about the financial and other benefits of invention protection under patent law.

27. Government and project officials in several countries including IITA officials at Ibadan, knew hardly anything about the commercial value of patents, or how to tap information from patent documentation and even less about the existence and mandate of WIPO. A similar finding was made in some Asian countries. These findings confirm the observations made in another recent JIU report about the desirability of some WIPO field presence that would, among other benefits, enable it to market its mandate and interact even more productively with its universal constituency (see "Decentralization of Organizations within the United Nations system", Part I, JIU/REP/92/6). While WIPO could establish more detailed and structured conventions of collaboration with counterpart national and regional organizations like ARIPO and OAPI in order to strengthen its field focus and role, such bodies hardly render WIPO's global mission redundant or irrelevant.

D. Human Resources Development (Training)

28. All the projects included a human resource development component varying significantly among the projects in terms of the proportion of budget allocation, number and category of trainees, as well as type and modality of training. Overall performance was rated as follows:

Excellent:	8 projects (ANSTI, ARCEDEM, ARCT, CNQP AGRHYMET, ESIPS, ESMT, RTCT)
Satisfactory:	4 projects (ECT, IDSC, DFPS, RMTA)
Other:	4 projects (EMSP/Abidjan, EMSP/Brazzaville, CMFAC, SGMC)

29. ANSTI is rated excellent only because it devoted close to 60 per cent of its budget to the training function. However, the level of training (predominantly graduate or doctoral) and type of training (essentially academic) were not considered by the Inspectors to be particularly suited in a region where the real science and technology priority is to build up indigenous technician skills on a massive scale. ESIPS allocated 68 per cent of its budget (the highest in the sample) to the training function. A total of 1,800 persons (university professors, government officials, judges lawyers, businessmen, engineers, patent attorneys and inventors) received various forms of training during the five-year duration of the project. Furthermore, ESIPS was the only project in which regular technical staff of the executing agency (WIPO) participated fully and consistently in performing the training function, accounting for 20 per cent of total training man/hours. However, much of the training offered by ESIPS was of a rather general character, ideal for raising awareness, but not for productive applications in specialized economic, manufacturing or extractive sectors.

30. ARCEDEM was quite successful in developing financial sustainability through its training function which is increasingly targeted to and appreciated by private sector enterprises. Although ARCT is confronted with a number of difficulties owing essentially to its very broad mandate and the weak financial support of its

Member countries, the Centre's workshops in informatics technology have been responsive to the needs of the region. Government officials and former trainees of the rest of the projects in category A expressed full satisfaction with the quality of training offered by those projects.

31. Among the projects with inadequate performance, the two postal training schools (EMSP) supported by UPU in Abidjan and Brazzaville, made the least use of modern technology in their training function. For example, only in 1991 was ESMP/Abidjan considering the introduction of a course on computer applications to postal services.

32. The Multinational Centre for Training in Civil Aviation (CMFAC) in Mvengué, Gabon, also was exemplary for poor performance. Its Director was neither a pilot nor an aeronautics engineer. The subcontractor who performed much of the training function did a poor job by all accounts, so much so that the graduates of the Centre were not acceptable for employment by any of the airlines of the participating countries, not even by that of the host country which had established the Centre to the tune of over US$ 20 million. More to that, the ICAO Chief Technical Adviser for the project had little or no knowledge of French, the Centre's only language of instruction.

E. Equipment

33. Information was sought on each project's stock of equipment, including specifications, choice and origin. Field inspections focused in particular on the appropriateness of the equipment to the project's functions and to available local skills as well as resources for financing operating costs. The Inspectors also assessed the extent to which the equipment had been assimilated

within the project, and the quality of value-added innovations, adaptations and overall maintenance by the project staff. The sample performance was the following:

Excellent:	2 projects (ARCEDEM, AGRHYMET)
Satisfactory:	4 projects (ARCT, ESIPS, ESMT, IDSC)
Other :	10 projects (ANSTI, CNQP, ECT, EMSP/Abidjan, EMSP/Brazzaville, DFPZ, CMFAC, RTCT, SGMC, RMTA)

34. ARCEDEM devoted 46 per cent of its project budget to the purchase of equipment, assessed, assembled and installed by the Centre staff. At the time of inspection the equipment was in excellent working condition. AGRHYMET also made provision for substantial equipment and for the training of personnel necessary to operate and maintain it properly. The project management expressed the conviction that AGRHYMET had the most skilled technicians in the region.

35. Among the projects rated as satisfactory, ARCT could equally have been rated excellent in view of the high technological capability of the Centre's staff to design and produce equipment prototypes well adapted to the region's needs and setting. However, ARCT devoted merely 4 per cent of its budget to the acquisition of equipment, almost 2 per cent less than its allocation for miscellaneous expenses. The equipment components of ESIPS, ESMT and IDSC were fully relevant to their functions and objectives, but the Inspectors could not determine the extent to which the intended beneficiaries and operators had been involved by the executing agencies in equipment specifications and installation or had been trained to make optimal use of such equipment.

36. Of the ten projects rated for inadequate performance, CMFAC, CNQP, DFPZ and RMTA had substantial stocks of equipment. Over US$ 15 million worth of equipment purchased with UNDP funds for CMFAC was found collecting dust at the time of field inspection, because the project was no longer operational by December 1991 as a result of the inability of the participating countries to pay their contributions to the Centre. What to do with the equipment pending a final decision of the Centre's governing body about the fate of the project, became a subject of sharp controversy between UNDP and the host government in particular.

37. Over 50 per cent of CNQP's stock of equipment was no longer functional by 1993, six years after the ILO executed project had been terminated. The inability or delays of the parent body of CNQP to finance replacement costs appeared to be the main problem. Equipment for DFPZ (reorganization of the Zaire public service) suffered from inadequate maintenance leading to frequent breakdowns. The stock of equipment for RMTA (Regional Maritime Training Academy, Accra, Ghana) was predominantly old-fashioned, though much of it was still in working condition thanks to the rare rehabilitation skills of the Academy's technical personnel. The equipment supplied to the Academy under the International Maritime Organization (IMO) executed project was patently inadequate relative to needs, and some of it arrived without operating manuals. Furthermore,

IMO did not fully involve the Academy management in assessing and specifying equipment requirements.

F. Scientific and Technological Literature

38. Under this heading each project was assessed for its production and dissemination and/or acquisition of scientific and technical literature (books, reports, periodicals, etc.) in its sphere of activity. The sample performed as follows:

Excellent:	5 projects (ANSTI, ARCEDEM, ARCT, ECT, IDSC)
Satisfactory:	5 projects (AGRHYMET, CNQP, DFPZ, ESIPS, RTCT)
Other:	6 projects (CMFAC, EMS/Abidjan, EMST, SGMC, RMTA)

39. While ANSTI, ARCT and ECT produced a significant volume of various publications (including video cassettes and films by ARCT) specifically targeted to the science and technology community, ARCEDEM and IDSC established well supplied documentation centres in their respective fields of activity. AGRHYMET, CNQP, DFPZ, ESIPS and RCTC likewise produced science and technology literature (documents, articles, reports, brochures or instruction materials), but circulation appeared limited to immediate project objectives. Generally, however, no budget line was specifically included in any of the project documents for the production/acquisition and dissemination of science and technology literature, which ought to be considered an indispensable component of any institution-building project.

G. Information system

40. Besides science and technology literature discussed above, each project was also assessed on the basis of its overall information system (computerized data base more particularly), with emphasis on its purpose and amount of information stored, number and category of regular users, quality and scope of linkages with other relevant information systems at the national, regional and international levels. The sample performed as follows:

Excellent:	4 projects (AGRHYMET, ARCT, ESIPS, IDSC)
Satisfactory:	2 projects (ANSTI, ARCEDEM)
Other:	10 projects (ECT, EMSP/Abidjan, EMST/Brazzaville, DFPZ, CMFAC, CNQP, ESMT, SGMC, RMTA, RTCT)

41. Of the high performing projects under this heading AGRHYMET had by far the most elaborate information system - for gathering, processing and disseminating agrometeorological and hydrological data with clear socio-economic and disaster control objectives. The system included agroclimatological observation stations complemented by the ASECNA network (Association de Surveillance et de Contrôle de la Navigation aérienne), for transmission of daily information to national meteorological services. These in turn processed and

issued reports to national users as well as to the AGRHYMET Centre itself through a radio network linking the participating countries of the Sahel.

42. The constant flow of national information into the AGRHYMET Centre was further strengthened by data from other sources, such as the Regional Remote Sensing Centre (CRTO) at Ouagadougou, Burkina Faso, or by information from observation satellites over Africa (TIROS, LANDSAT, METEOSAT). The AGRHYMET information system, which was additionally linked to the World Weather Watch Programme operated by WMO, enabled the project to keep constant track of the evolution of agrometeorological and hydrological conditions in the Sahel.

43. However, some United Nations system officials interviewed during field inspection criticized AGRHYMET's information system for relying too heavily on highly sophisticated information gathering methods whose sustainability could not be guaranteed over the long term. It was observed that, even after detailed analysis and processing by the AGRHYMET Centre, much of the information thus fed from many sources was still of a very general character and could not therefore be usefully applied in the participating countries having varying ecological zones. It was suggested to give priority to empirical observations of agroclimatological conditions, based on the time-tested agropastoral culture of the Sahel communities. It was argued that such down-to-earth observation methods, duly researched and enhanced, would be a more practical proposition than the "high-tech" methods which appeared entirely alien to the peasant farming communities. This view was not shared by FAO and WMO, which contended that the project's success was due largely to the practical and effective use of advanced techniques where the traditional systems had failed.

44. The other information systems rated as excellent or satisfactory were confronted more or less with the same problem noted above, for information systems are valuable only to the extent that they can be exploited fully by the intended beneficiaries for science and technology and related socio-economic purposes. While ARCT and ESIPS can be credited with an excellent performance under this heading it could not be ascertained during field visits how productively the beneficiaries were using information supplied or available to them under the two projects in question. Besides AGRHYMET, IDSC was the only other project with a clear-sighted and measurable information system goal, namely to rationalize the Egyptian Cabinet decision-making process and, by the same token, streamline all services directly and indirectly affected by that process through an automated management information network covering the entire country.

H. Technical backstopping

45. The Inspectors investigated the degree of involvement by each agency in project implementation, with emphasis on the total man/hours devoted to the project by the executing agency's regular technical staff; the number and duration of technical missions to project-activity site(s); the scientific and technical documentation produced by the regular staff in connection with the project; and

the nature of linkage still existing between the executing agency and the project since its termination, if applicable. The sample performed as follows:

Excellent:	4 projects (CNQP, ESIPS, IDSC, SGMC)
Satisfactory:	4 projects (AGRHYMET, ANSTI, ECT, RTCT,)
Other:	8 projects (ARCEDEM, GARCT, EMSP/Abidjan, EMSP/Brazzaville, CMFAC, ESMT, DFPZ, RMTA)

46. WIPO's backstopping performance was probably the most illustrative of what JIU would expect of a United Nations system executing agency in supporting institution-building in a typical developing country. During the five-year period of ESIPS, WIPO's regular technical staff devoted a total of 3,600 man/hours to the project, conducted 40 missions lasting an average of three to four days each, prepared instruction materials and provided a diverse range of documentation to project participants, and participated in training activities. Furthermore, WIPO and ILO (for CNQP) have continued to maintain various contacts with their respective projects after their termination. The role of the Office for Projects Services in the successful conduct of the IDSC project was highlighted in the mid-term evaluation report of 1989. The Government of Ghana expressed full satisfaction and even appreciation during field investigation for the backstopping role of DTCD in respect of SGMC.

47. Although AGRHYMET was a successful project, WMO's backstopping performance received rather mixed assessments at the field level. While some government officials expressed complete satisfaction with WMO's original substantive contribution in helping to formulate project strategy, other officials and UNDP field staff in particular judged WMO's technical follow-up inadequate, an assessment which was not shared by WMO in its comments on the draft of this report. Nevertheless, like in most other projects in the sample, technical and operational back-up of AGRHYMET was apparently handled mostly by the chief technical adviser and, after the latter's departure, by the Director of the AGRHYMET Centre. But FAO as associate executing agency did make a valuable contribution to the success of AGRHYMET.

48. None of the persons interviewed during field investigations doubted the high competence of WMO's technical co-operation staff at the organization's Geneva Headquarters. What appeared to be the problem, which was confirmed by the Inspectors during a visit to WMO in the course of this study, was the work overload of WMO's technical co-operation programme, whose staffing appeared clearly inadequate for the backstopping requirements of WMO's expanding field activities. Some officials interviewed during field visits suggested a JIU evaluation of WMO's technical co-operation programme similar to the Unit's evaluation of ITU's, IMO's and ICAO's programmes.

49. The least effective backstopping was, however, provided by ECA (ARCEDEM and ARCT) DTCD (DFPZ) ICAO (CMFAC) and UPU (EMSP Abidjan and Brazzaville). Not only did ECA provide no evident substantive contribution to any of the functions of its executed projects but even its administrative backstopping was characterized by considerable delays that checked the smooth progress of project operations.

50. In addition, ECA wholly retained and managed support cost resources in respect of the two projects even though over half of the support activities supposed to be covered by those resources were performed by ARCEDEM and ARCT staff, from equipment specifications to the organization of workshops. It was evident to the Inspectors that both ARCEDEM and ARCT were equipped in every respect to assume full execution of their respective projects, without ECA's intermediation.

51. More generally, moreover, ECA's poor backstopping performance revealed the persistence of operational inefficiencies reported by the JIU over ten years ago in its 1982 comprehensive review of ECA's programme operations (see "Report on the Economic Commission for Africa: Regional programming, operations, restructuring and decentralization issues", (JIU/REP/82/1). The question that arises therefore is whether ECA should be entrusted with any more project-executing responsibilities without drastic reform of its internal project backstopping system such that allows for substantial decentralization of authority and functions to the project level.

52. DTCD's backstopping of DFPZ was equally bedeviled by considerable delays in the provision of various inputs, which were further compounded by the constant turnover of key counterpart officials in the host government. The projects executed by ICAO and UPU were conspicuous failures partly because the project designs and justification appeared more heavily influenced by political opportunism than by considerations of technical and operational feasibility, and partly because the projects were grafted upon institutions whose long-term financial sustainability had not been established in the first place.

I. Co-operation and interaction

53. The Inspectors assessed the intensity of co-operation/interaction between each project and other similar projects executed at whatever level by the same agency. Investigations also focused on the degree of interaction between each project and its socio-economic and technological environment, including national science and technology ministries or agencies; public and private sector corporations and activities; educational and research institutions; local and international non-governmental organizations; etc. Special emphasis was placed on linkages with the private or parapublic sector in view of its privileged role in the application and diffusion of science and technology resources for socio-economic advancement. The sample performed as follows:

Excellent:	3 projects (ARCEDEM, CNQP, ESIPS)
Satisfactory:	8 projects (AGRHYMET, ANSTI, ARCT, ECT, ESMT, IDSC, RMTA, RTCT)
Other:	5 projects (EMMSP/Abidjan, EMSP/Brazzaville, CMFAC, SGMC, DFPZ)

54. Both ARCEDEM and CNQP exhibited a clear thrust towards the private sector, while ESIPS developed working relations with other WIPO-executed projects, especially in Nigeria and Zaire, as well as with government and private-sector institutions, including NGOs. AGRHYMET, ARCT and ECT would have equally featured in the first category except that their outputs appeared slow in reaching out to the production level. In this regard ECT was particularly constrained by the Ethiopian Government's macro-economic policy of the late seventies. IDSC's links to the major governmental and quasi-governmental departments of Egypt were entirely satisfactory in the assumption that efficient processes which the project sought to induce in those departments would create an enabling, efficient environment for the national production system.

55. The Multinational Centre for Training in Civil Aviation at Mvengue (CMFAC) was limited in its interactions by the overall weak support provided to the project by the participating countries, both financially and in the placement of trainees or employment of the Centre's graduates.

56. UNDP field staff contrasted the failure of CMFAC to the abiding success of the Addis Ababa Aviation Training School, which had a long and rich history of technical co-operation with Trans-World Airlines (TWA), an experienced and successful airline which helped to build up and sustain, through continuing practical training and staff exchanges, the technological base of the Ethiopian School. No such technology transfer type of association with an experienced carrier existed in the case of CMFAC.

57. Further, the training offered by the Ethiopian School is very closely tied to the needs and operations of the Ethiopian Airlines, which has very successfully absorbed into its corporate system the wealth of technological experience deriving from its many years of twinning with Trans-World Airlines. As a result, the School today operates an aircraft maintenance centre that is reputed to be among the best in the world, and to which even carriers in the developed countries send their aircraft for maintenance. CMFAC had none of these essential attributes.

J. Building sustainability

58. The Inspectors assessed the financial, technological and institutional sustainability of each project using a number of factors, including particularly the pattern of host government(s)' financial support; capacity to generate funds through self-financing activities; capacity to adapt, innovate and build on imported technologies; ratio of institutional costs relative to programme costs; periodicity of audit and internal evaluation exercises; contribution to cost-savings and operational efficiencies within the assisted institution; etc. The sample performance was the

following:

Excellent:	4 projects (ARCEDEM, ECT, ESMT, IDSC)
Satisfactory:	4 projects (CNQP, ESIPS, RMTA, SGMC)
Other:	8 projects (AGRHYMET, ANSTI, ARCT, CMFAC, DFPZ, EMSP/Abidjan, EMSP/Brazzaville, RTCT)

59. ARCEDEM which, like ARCT, was for many years strapped for funds because of inadequate and irregular payments of Member States contributions, introduced in 1989 significant reforms which set the Centre on the path of financial and institutional sustainability. Administrative staff which hitherto had absorbed most of the Centre's budget were reduced by 40 per cent, leading to significant cost savings. New training and consultancy activities were developed to generate resources and to place the Centre on a self-financing keel. In addition, ties to the private sector were strengthened for the same purpose, so much that, in 1991 for example, the Centre was able to collect US$ 500,000 from training activities alone.

60. ARCEDEM's strategy as regards technological sustainability is not to reinvent the wheel by trying to build entirely new technologies, which are costly to research and develop. The Centre believes that because of the deep interpenetration of technological disciplines and modes, there is hardly any wholly new technology as such. The course of action pursued by the Centre is therefore to emphasize the ability to adapt imported technologies to local needs and conditions. The Centre's consultancy programme is equally very promising provided it can strengthen its collaboration with relevant organizations within and outside the United Nations system. The Centre could, for example, conclude a memorandum of understanding with UNIDO enabling ARCEDEM to serve as subcontractor for a specified category of UNIDO's projects in Africa. Such a convention would be a model of support by the United Nations system for science and technology institution-building in Africa.

61. The other high performing projects (ECT, ESMT, IDSC) all enjoyed consistently strong host government support in all respects, which guaranteed their long-term viability. In addition, ESMT added to its curriculum a new course on the administration and management of telecommunication services. This course, which was not originally foreseen in the project document, was delivered in collaboration with a private sector consulting firm based in Dakar. The novelty of this laudable initiative included training emphasis on the right professional standards and attitudes towards customers, the need for efficiency and profitability, and proper financial accounting systems.

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United Nations system support for science and technology in Africa

Note by the Secretary-General

Addendum

The Secretary-General has the honour to submit to the General Assembly and the Economic and Social Council the comments of the Administrative Committee on Coordination on the report of the Joint Inspection Unit entitled "United Nations system support for science and technology in Africa" (A/50/125-E/1995/19, annex).

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ANNEX

Comments of the Administrative Committee on Coordination on the report of the Joint Inspection Unit entitled "United Nations system support for science and technology in Africa"

I. GENERAL COMMENTS

1. The subject under examination in the report of the Joint Inspection Unit (JIU) is the evaluation of the United Nations system support for science and technology in Africa. Since the adoption in 1979 of the United Nations Vienna Programme of Action on Science and Technology for Development, 1/ this subject has featured consistently on the agendas of central United Nations intergovernmental bodies, thus indicating the importance that Member States assign to science and technology issues. The Inspectors, on the basis of their field investigations and discussions with project operators and end-users on the subject of the information supplied by executing agencies and the review of project documentation, have come to the conclusion that the response of organizations and agencies of the United Nations system in supporting the implementation of the Vienna Programme of Action has not matched the expectations and needs of many developing countries. In the view of the authors, the significant international financial support anticipated by the Programme of Action has not materialized; the science and technology policies and programmes of the United Nations system are hardly coordinated around strategic goals; institutional and programme adjustments are inadequate and a common operational science and technology framework is absent. Based on their assessment and a review of the projects being executed in the African region, the Inspectors have made a number of recommendations aimed at enhancing the effectiveness of the United Nations system support for science and technology in Africa.

2. The Administrative Committee on Coordination (ACC) has found the topic of the report of great importance and interest to the United Nations system and in particular to those organizations and agencies involved in development assistance and transfer of technology to developing countries. The Committee has noted that the report has attempted to address the activities of the United Nations system in support of endogenous science and technology capacity-building in developing countries, but, in view of the complex and extensive nature of the subject, the focus has been narrowed to science and technology institution-building. The authors of the study have also attempted to develop a methodology in that regard. Despite the intent to restrict its focus, the report nevertheless details complex and wide-ranging issues - from specific problems of the transfer of technology to the general difficulties of institution-building and of the current development context in the African region.

3. Members of ACC consider the study to be a very thorough, informative and valuable one, highlighting the issues that deserve critical and timely consideration by the United Nations agencies working in the area of science and technology for development in general and on the African continent in particular. Most of them believe that its focus on institution-building efforts for science and technology for development is most appropriate, in so far as

many current initiatives and actions in that field tend to focus on skills acquisition to the neglect of institution-building, which is a vital element in the spread, adaptation and utilization of science and technology.

4. Some members of ACC stressed, as a positive moment of the report, the attempt of the authors to embed technological development in its social, economic and cultural context, with the intention to bridge questions of technological development with those of human development.

5. ACC supports the general thrust of the conclusions and recommendations, which are generally constructive and fair and, in the view of the Committee, have been framed to some extent to link up with current priorities and trends of the United Nations system, such as sustainability, programme approach, participation of beneficiaries, national execution and regional cooperation and integration. It also agrees with the authors that a lot could and should be done to improve the activities of the United Nations system as part of the solution of this important problem. However, in some instances, the report was found to contain a number of shortcomings, which, to some extent, diminished the value of the study.

6. First of all, some members of the Committee question the decision of the Inspectors to evaluate only the institution-building projects. Moreover, even in the case of agreement with such an approach, some agencies comment that the concept advanced by the authors mixes issues related to the set up and operation of institutions, on the one hand, and those concerned with the support extended to an institution during its establishment or strengthening phase, on the other. They consider it very important to distinguish between these two aspects in order to ensure the later sustainability and independence of such institutions. One organization commented that even if the selection of projects dealt with in the report took into account the balance at geographic and thematic level, it had some difficulty finding a common denomination for the 16 projects evaluated in the report. This point raises the question of the special nature of science and technology projects and how they differ from general technical assistance projects. Some members of ACC find it regrettable that none of the projects chosen for the evaluation were related to industries and to institutions for technological support to the productive sector.

7. Members of the Committee who have long experience in science and technology institution-building at the regional level agree that, as an ideal case, typical developing countries, and particularly the least developed ones, would normally require institution-building projects with as many as possible of the 10 functions used by the Inspectors and listed in the report. However, they are of the view that in order to deliver meaningful outputs along all those diverse and complex functions, such an institution requires both extensive institutional infrastructure and operational funds, which, in practice, are not available. One solution to the problem may be the execution of such institution-building projects as an integral part of a broader programme at the national and/or regional level. Another solution could be the concentration of responsibilities of an institution on a few selected functions in order to avoid ineffective overstretching of efforts on too many fronts. Such regional institutions, from the point of view of the experience of the agencies, which coincides with the views of Member States, may be successful in servicing the countries' needs, on

condition that the projects are sharply focused on specific areas identified by the participating and beneficiary countries themselves, in accordance with their needs and priorities.

8. ACC concurs with the Inspectors' view that the eight operational guidelines adopted in 1983 by the Intergovernmental Committee on Science and Technology for Development should be updated in order to provide a more comprehensive conceptual framework for the development and transfer of technology. Their usefulness in their current form is somewhat limited. Moreover, as also noted by the Inspectors in the executive summary of their report, even those guidelines are hardly applied at the field level by all organizations, owing also to the lack of awareness of their existence either at the level of the executing agencies or of field project management (see also para. 42 of the Inspectors' report). It is the opinion of ACC that an effort should be made to develop new or improved guidelines and to ensure their application.

9. Some members of the Committee consider it irrational to explain the shortcomings of the implementation of operational guidelines for United Nations system support for science and technology by the lack of "common understanding" within the system of "what constitutes science and technology for development activities". As a justification of that conclusion, the Inspectors present at length different conceptual approaches of various organizations and agencies of the United Nations system to the subject. While agreeing with such an approach from a historical point of view, members of the Committee believe that it cannot form a basis for viable technology-related policy and that the main thing is not to look for a uniform comprehensive category or a definition of what constitutes science and technology for development, but rather to identify the real cause of the drawback to building the endogenous scientific and technological capacities of developing countries.

10. One organization expressed its concern that the Inspectors, in providing a long list of definitions of science and technology offered by various United Nations agencies and organizations, failed to present the conceptual definition of the Economic Commission for Africa (ECA) on the subject, in spite of the fact that the whole report is dealing with science and technology in the African region.

11. In the view of some agencies, the report provides very little insight on what policy reforms are needed to further science and technology progress in Africa and what the United Nations system could do to formulate and support such policy reforms. The report is also silent on the crucial issue of financing science and technology for development. While billions of dollars need to be invested in science and technology in Africa in order to break out of poverty, the analysis in the report of whether a few thousand dollars are spent or not on science and technology equipment on a project financed by a United Nations agency seems irrelevant.

12. Some members of ACC would have liked to have seen in the report the reference to reforms that are needed to unleash the entrepreneurial energies of the people in the African countries that would jumpstart the economy and enable rapid development. This is also of crucial importance in view of the very low level of private enterprise and of industrial development on the continent.

13. Some members of the Committee believe that the collective efforts of the United Nations system for institutional capacity-building in science and technology in Africa should be combined with country approaches. It should be mentioned that the generation, acquisition, transfer and diffusion of technology are often influenced by macroeconomic policy incentive schemes, price distortions, economic liberalization and structural adjustment policies. They stress that the findings and conclusions of the report could have been even more useful if it had included an in-depth analysis of the effects of the above factors on efforts to transfer science and technology to low-income and least developed countries.

14. Several members of the Committee expressed their concern that their preliminary comments on the report provided to the JIU, in particular their positive experience in the area under consideration, had not been included by the Inspectors in the final version of the document.

II. COMMENTS ON RECOMMENDATIONS

Recommendation 1. Institution-building functions

Organizations of the United Nations system should refine and adopt at the level of ACC, mutatis mutandis, the 10 institution-building functions used in the present report as a normative framework for the design, execution and evaluation of institution-building projects in the low-income countries generally and in the least developed countries more particularly. The framework should be incorporated into the organizations' technical cooperation policies and procedures manuals.

15. Members of ACC support in principle as useful the suggested normative framework for the design, execution and evaluation of institution-building projects. They believe, however, that the application of such a framework should not be limited to low-income and least developed countries, but should also be used in technical cooperation in general. Some of them reserve the possibility for individual agencies, in adapting the framework, to add additional aspects, like social aspects, international labour standards and so on.

16. In the view of one organization, for the purpose of the preparation for a normative framework for the design, execution and evaluation of institution-building projects, it would be useful to distinguish explicitly between modes of production, organization, technology and innovation in different countries and regions. From the methodological point of view, it seems inadequate to stress scientific and technological awareness of specific target groups, as indicated in paragraph 35 (a) related to the 10 institution-building functions. It would rather be advisable to suggest here practical orientations subject to analysis of major perspectives for radical improvement of productive development in low-income countries.

Recommendation 2. Sustainability

All institution-building project proposals should be justified by a thorough pre-feasibility analysis of the long-term cost benefits and financial sustainability of the supported institution, as the main condition for United Nations system support, and self-financing project activities should be encouraged and reflected in project designs whenever appropriate. The relative cost-effectiveness of different implementation strategies and tools should also be examined.

17. ACC is in full agreement with the idea in this recommendation that the long-term financial sustainability aspects should be one of the main prerequisites for United Nations system support for institution-building projects.

Recommendation 3. Programme approach

The programme approach to technical cooperation mandated by the General Assembly in resolution 44/211 should be applied more systematically and comprehensively to institution-building proje[illegible].

18. Members of ACC support this recommendation and state that in their activities in the area under consideration they apply, to the extent possible, the provisions of General Assembly resolutions 44/211 of 22 December 1989 and 47/199 of 22 December 1992.

Recommendation 4. Technical backstopping

(a) All funding organizations of the United Nations system should consider the possibility of a set of penalties, to be agreed upon at the level of ACC, so that the designation of executing agency is made subject to past performance, which also takes into account the performance of national counterpart institutions;

(b) Project agreements should explicitly specify and quantify the direct technical inputs to be provided by the r[illegible]ular personnel of the executing agency within or outside t[illegible] United Nations system (e.g. total man/months to be devoted to the project, number of technical missions to be conducted, volume of science and technology literature to be produced or provided to the project, etc.).

19. The proposal contained in part (a) of this recommendation drew sharp criticism from a number of organizations and agencies of the United Nations system. They believe that the idea concerning the introduction of "a set of penalties" seems inappropriate and impractical to implement, as far as it raises many questions, such as how and by whom the past performance will be evaluated, whether a poor performance in one country will lead to sanctions in another and

so on. While questioning the need for the recommended measures, members of the Committee point to the established mechanisms, such as tripartite reviews, progress reports, review and evaluations, and so on, that are all geared to measure project progress and achievements and to ensure corrective actions, if needed.

20. Some members of the Committee consider both parts of this recommendation to be out of tune with recent developments as regards implementation modalities of the United Nations operational activities, that is, the national execution and programme approach. Under those modalities the main responsibility for programme design rests with the funding agency and the national executing agency, rather than with the United Nations agency. Furthermore, part (b) of the recommendation tends to focus on project inputs, whereas under the programme approach the main concern should be with outputs and impact.

21. With regard to the new element in part (b) suggesting the specification of the volume of science and technology literature to be produced or provided to the project, presumably by the executing agency, some members of the Committee consider it extremely difficult, not least because this proposal assumes that every project has an equal need for science and technology literature. Besides, the suggestion assigns more weight to quantity rather than quality of such literature.

Recommendation 5. Chief Technical Advisers

> Justification for the Chief Technical Adviser's position should be very clearly established for projects supporting well-established institutions at the national or regional level, which should be used increasingly as implementing agencies.

22. Some members of ACC understand this recommendation as an implicit reference to the expansion of the national execution modality and the use of local expertise for project management, both at the national and regional level. However, due consideration should be given to local circumstances, in particular in regional settings, where extensive pools of national expertise may exist but where employment of chief technical advisers in functions of project/programme management is still desirable in many cases. Other agencies mention that there is factual evidence of ineffectiveness of technical assistance, especially of technology transfer, centres in developing countries. The major trend today for improving the situation in those areas is to give the technical assistance funds directly to developing countries and to let them decide how to spend the money. They believe that in order to reshape aid so that it could meet particular objectives, it would be useful to have comprehensive, integrated country balance sheets of resource flow. Offering the resources as budgetary support would enable the receiving Governments to employ national experts where available. In this context the proposed idea regarding the Chief Technical Advisers seems premature.

Recommendation 6. Linkages to the production system

The end-users targeted by institution-building projects should, to the extent feasible, be involved at the design and planning stages of such projects, and linkages to the production system and to the private sector more particularly should be specified clearly in project agreements, depending on the nature and objectives of the project and local conditions.

23. The suggestion to ensure the linkage between institutions and the productive sector is fully supported by the members of ACC. They mention that in any institution-building project the end-users are taken into account at the planning and organizational set-up of an institution. For science and technology institutions the issue of the relationship with end-users is even more pertinent, as far as an adequate balance is required between scientific research, technology development and industrial application. Some agencies noted that this recommendation put excessive emphasis upon short-term solutions, which, though pragmatic, would not resolve the broad issue of raising overall capacities for addressing long-term challenges relative to science and technology. In their view, regional or national science and technology institutions in Africa will require long-term support from external resources. The success of long-term commitments has been well illustrated by those science and technology institutions which have benefited from the global indicative planning figure of the United Nations Development Programme (UNDP) for the past 15 to 20 years.

Recommendation 7. Regional setting

Within the framework of the United Nations New Agenda for the Development of Africa in the 1990s, the Secretary-General of the United Nations should:

(a) Initiate discussions at the highest level of ACC concerning the possibility of increased United Nations system policy and programmatic collaboration in support of science and technology capacity-building in Africa, especially in the key areas identified in chapter III of the present report;

(b) Consider the feasibility and timeliness of establishing a few pilot science and technology strategic institutions of national or subregional scope as recommended in paragraphs 72 and 73;

(c) Undertake consultations in the context of the United Nations New Agenda for the Development of Africa in the 1990s on the possibility of a summit meeting by the Organization of African Unity on science and technology for development in Africa, with substantive contributions from all organizations of the United Nations system.

24. ACC recognizes the great importance of the proposal contained in part (a) of this recommendation, as far as the United Nations New Agenda for the Development of Africa in the 1990s, in its paragraph 38, urges international support for enhancing the scientific and technological capacities of African countries. As far as part (b) of the recommendation is concerned, some members of the Committee expressed their surprise that at a time when African Governments have asked for rationalization and consolidation of the network of the regional and subregional institutions, out of which eight are in the field of science and technology, the report can contemplate the feasibility and timeliness of establishing a few strategic science and technology institutions that could be built from scratch. They believe that the real challenge of institution-building in science and technology in Africa is not to create new institutions in that area but to consolidate existing ones and to have them properly staffed and financed. With regard to part (c) of the recommendation, some agencies stress that the Organization of African Unity (OAU) holds its summits annually and it might therefore be appropriate to devote one of those summit meetings to the problems of science and technology for development in Africa. Concerned organizations of the United Nations system could assist the OAU secretariat in the preparation, organization and running of such a meeting.

Notes

1/ See Report of the United Nations Conference on Science and Technology for Development, Vienna, 20-31 August 1979 (United Nations publication, Sales No. E.79.I.21 and corrigenda), chap. VII.